



**G120F·G160F·G200F**

**Shop manual**



**Loncin Motor Co., LTD**

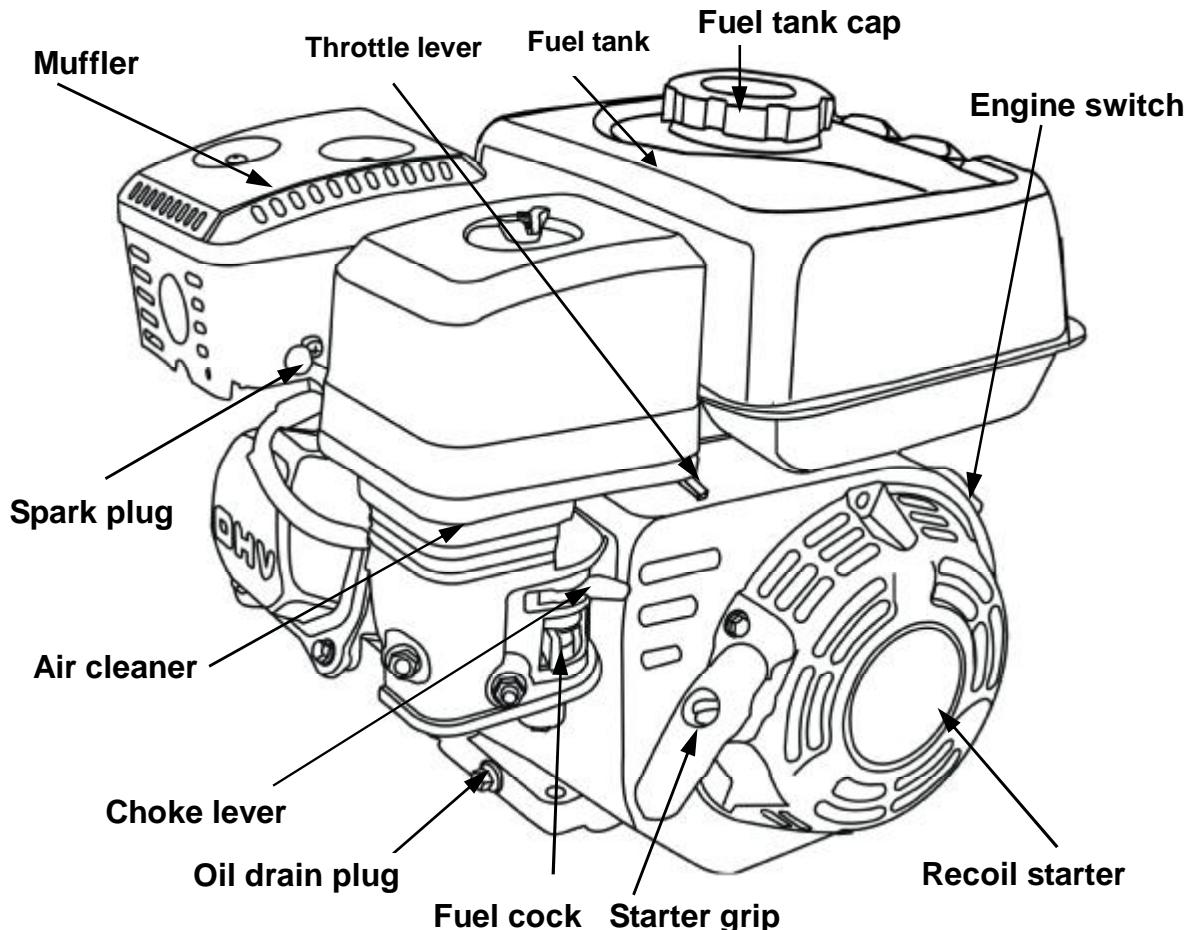
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1-1. Introduction	1-2. Product parameters	1-3. Dimensions (boundary and mounting dimensions)
	1-4. PTO assembly drawing	1-5. Wiring diagrams

## 1-1 Introduction



**Air cleaner**—protects the engine through removing dust and other impurities in the air.

**Spark plug**—delivers the high voltage of the ignition coil into the engine's combustion chamber, and produces sparks by electric discharge between electrodes, to ignite the fuel-air mixture.

**Muffler**—prevents the engine noise from traveling, so as to lower noise of the exhaust system.

**Fuel cock**—a switch in the fuel line to control the fuel flow in the fuel line.

**Recoil starter**—serves to start the engine

**Choke lever**—closes the choke before engine's cold starting, and the carburetor will deliver a very rich mixture to let the engine be easily startable. When the engine has warmed

up, the choke lever shall be fully opened.

**Engine switch**—before starting the engine, the switch shall be put in the ON position; if you put the switch in the OFF position the engine will be shut down

**Throttle lever**—serves to adjust the engine speed, so as to obtain the power and speed you want.

**Fuel tank cap**—when loosened, fuel can be added into the fuel tank; when tightened, fuel can be sealed in the fuel tank.

**Fuel tank**—stores the fuel and delivers fuel to the carburetor.

**Oil drain plug**—when loosened, all engine oil in the engine can be drained off so that engine oil can be changed

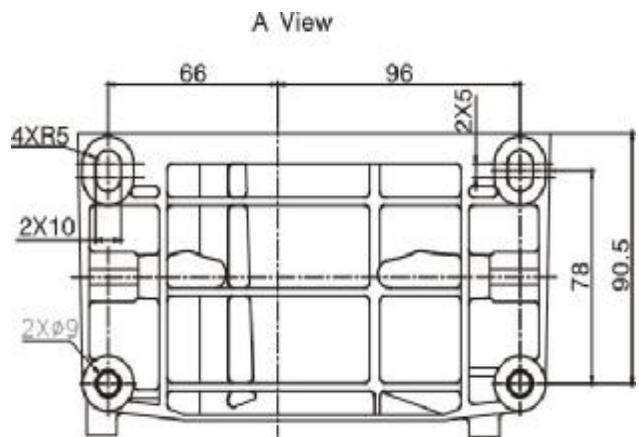
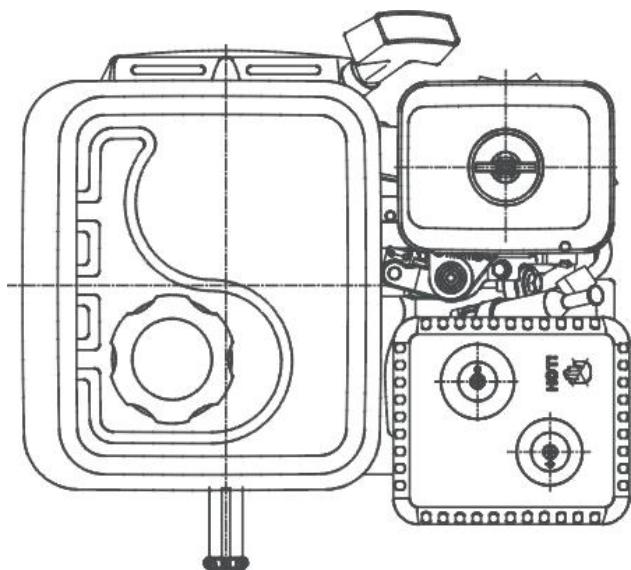
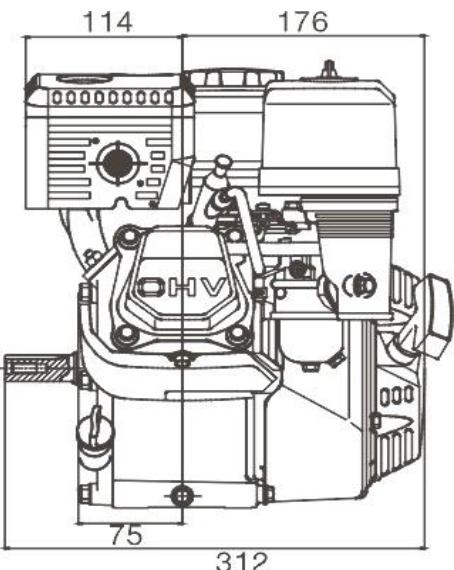
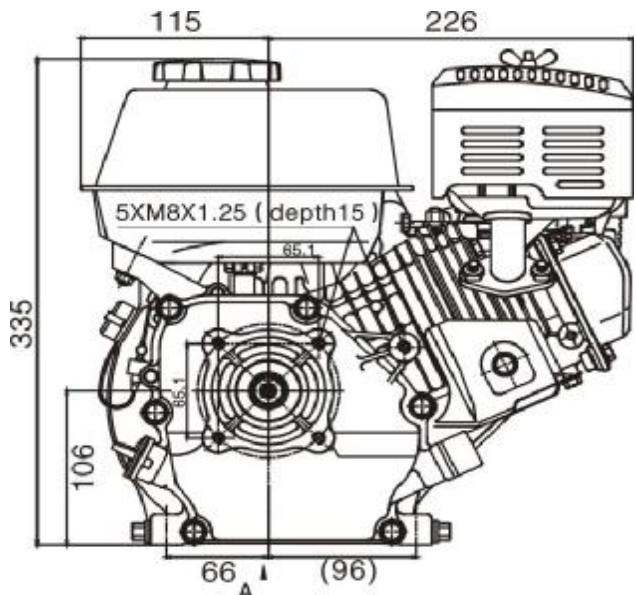
## 1-2 Product parameters

Engine model	G120F	G160F/ G160FD	G200F/ G200FD		
Engine type	Single cylinder, 4-Stroke, Forced Air Cooling, OHV25°				
Net power (KW/3600rpm)	2.6	3.6	4.1		
Net torque (N·m/rpm)	7.3/2500	9.9/2500	12.4/2500		
Bore×stroke(mm)	60×42	68×45	68×54		
Displacement (cc)	118	163	196		
Compression ratio	8.5:1	8.5:1	8.5:1		
Engine oil capacity (L)	0.6	0.6	0.6		
Fuel consumption rate (g/KW.h)	≤395				
Engine oil consumption rate (g/KW.h)	≤6.8				
Idle speed (r/min)	1400±150				
Noise (≤7m)	70dBA				
Starting mode	Recoil	Recoil /Electric			
Noise (≤7m)	70dBA				
Lubrication mode	Splash				
Cooling system	Forced air cooling				
Stopping mode	Grounding				
Fuel	Unleaded gasoline for vehicles				
PTO shaft rotation	Counterclockwise (seen from the end of output shaft)				
Ignition system	T.C.I.				
Ignition timing	25°BTDC (fixed)				
Air cleaner type	Semi-dry, oil bath, foam filter				
Carburetor	Horizontal butterfly valve				
Boundary dimension (L.W.H)	305×341×318	312×362×335	312×362×335		
Dry weight (kg)	13	15(18)	16(19)		

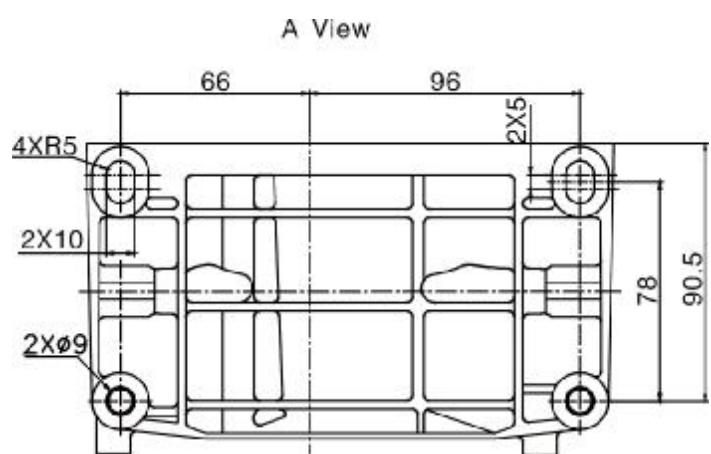
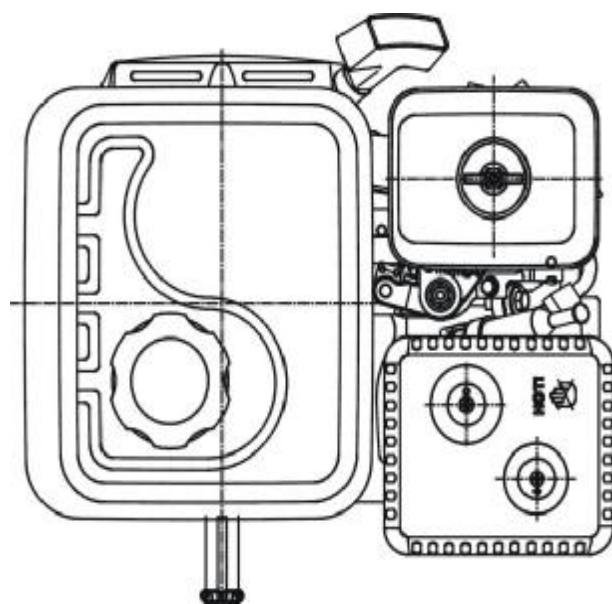
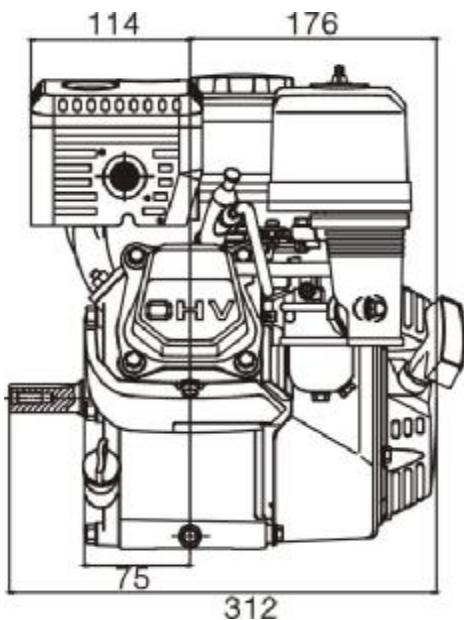
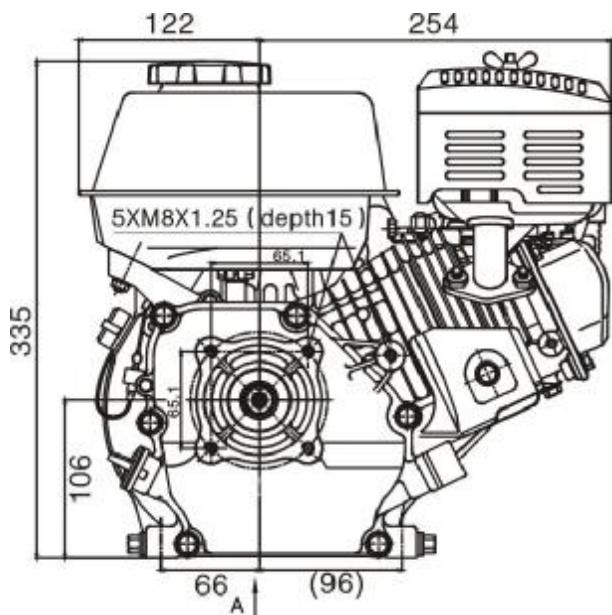
Engine model	G160F(D)-B	G200F(D)-B	G160F(D)-C	G200F(D)-C		
Engine type	Single cylinder, 4-Stroke, Forced Air Cooling, OHV25°					
Net power (KW/4000rpm)	3.6	4.1	3.6	4.1		
Net torque (N·m/rpm)	19.8/1250	24.8/1250	19.5/1250	24.8/1250		
Power output mode	Clutch		Chain			
Reduction ratio	2: 1					
Bore×stroke(mm)	68×45	68×54	68×45	68×54		
Displacement (cc)	163	196	163	196		
Compression ratio	8.5:1	8.5:1	8.5:1	8.5:1		
Engine oil capacity (L)	0.6	0.6	0.6	0.6		
Fuel consumption rate (g/KW.h)	≤395	≤395	≤395	≤395		
Engine oil consumption rate (g/KW.h)	≤6.8					
Idle speed (r/min)	1400±150					
Noise (≤7m)	70dBA					
Starting mode	Recoil /Electric					
Lubrication mode	Forced splash					
Cooling system	Forced air cooling					
Stopping mode	Grounding					
Fuel	Unleaded gasoline for vehicles					
PTO shaft rotation	Counterclockwise (seen from the end of output shaft)					
Ignition system	T.C.I.					
Ignition timing	25°BTDC (fixed)		25°BTDC (fixed)			
Air cleaner	Paper and foam filters					
Carburetor	Horizontal butterfly valve					
Boundary dimension (L.W.H)	391×362×335	391×376×335	342×362×335	342×376×335		
Dry weight (kg)	19 (22)	20 (23)	15.5 (18.5)	16.5 (19.5)		

### 1-3 Dimensions (boundary and mounting dimensions)

G120F

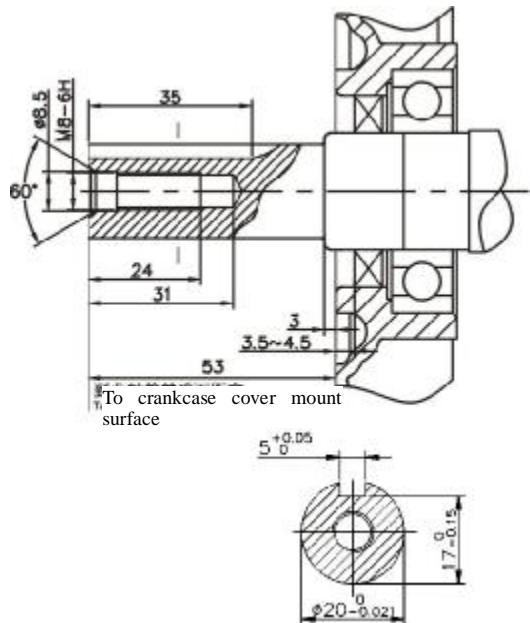


## G160F/G200F

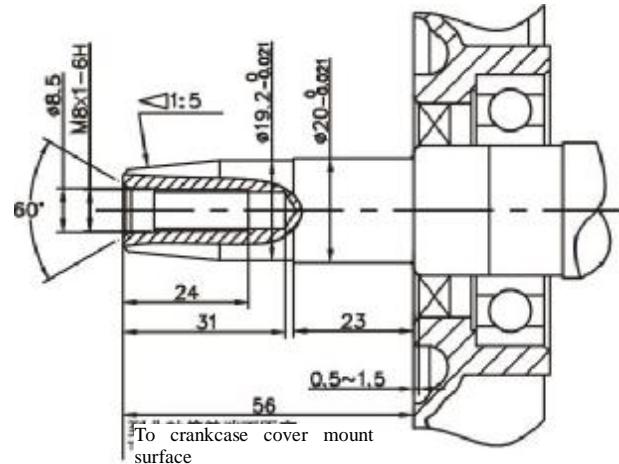


## 1-4 PTO assembly drawing

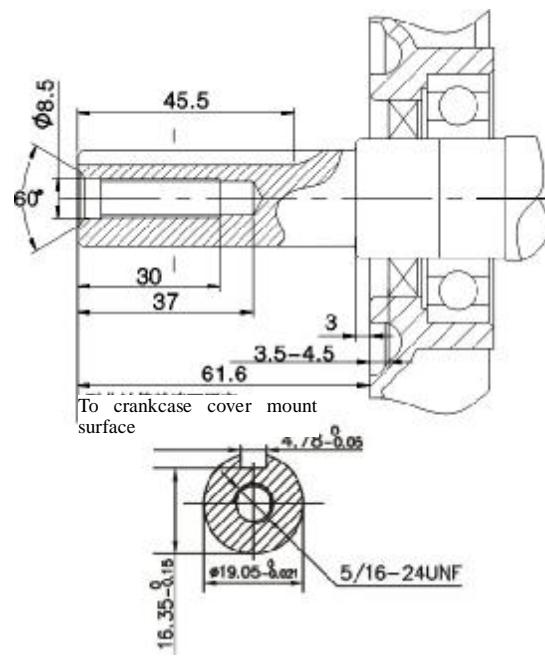
## G120F/G160F/G200F



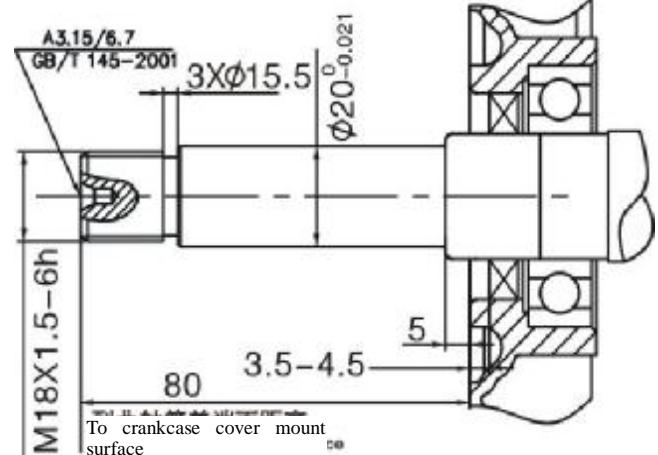
A Type



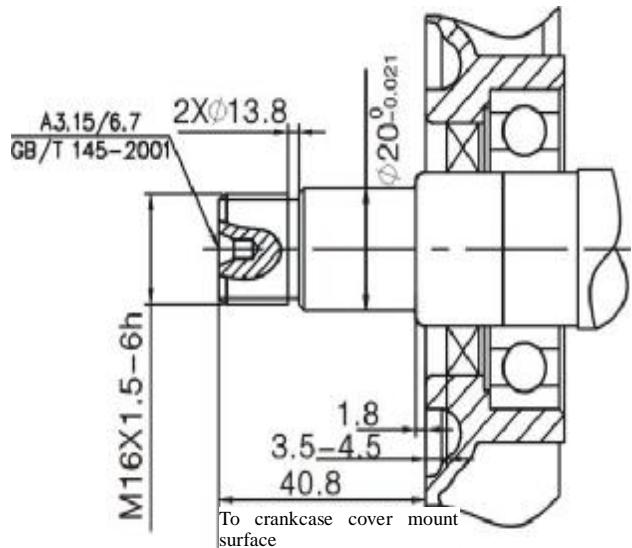
C Type



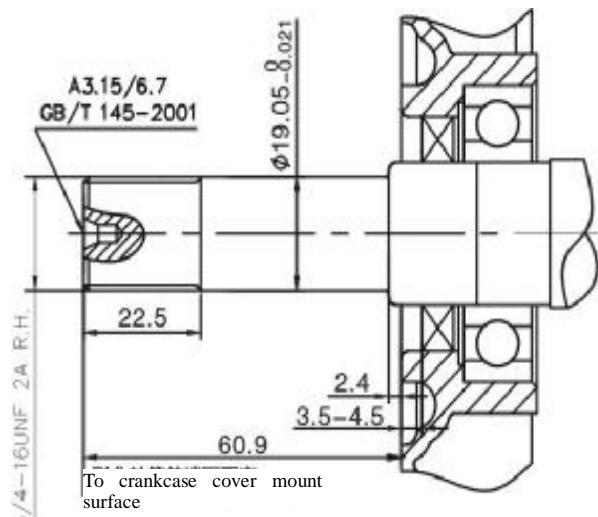
R Type



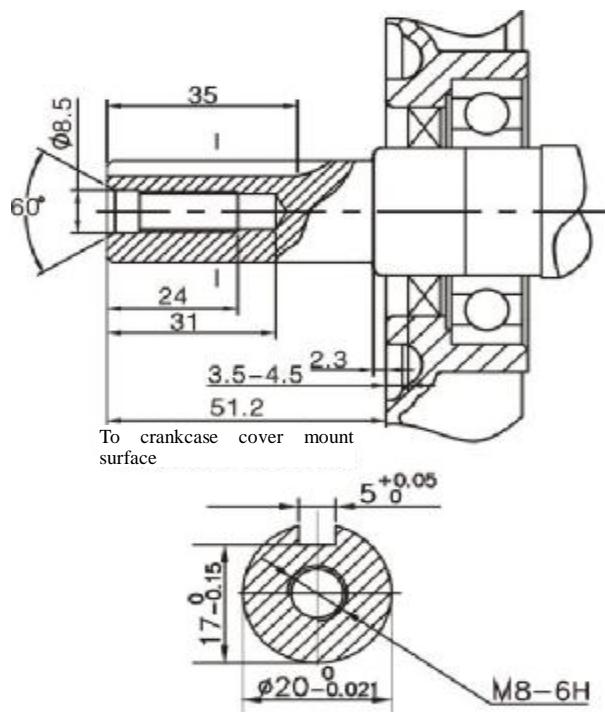
D Type



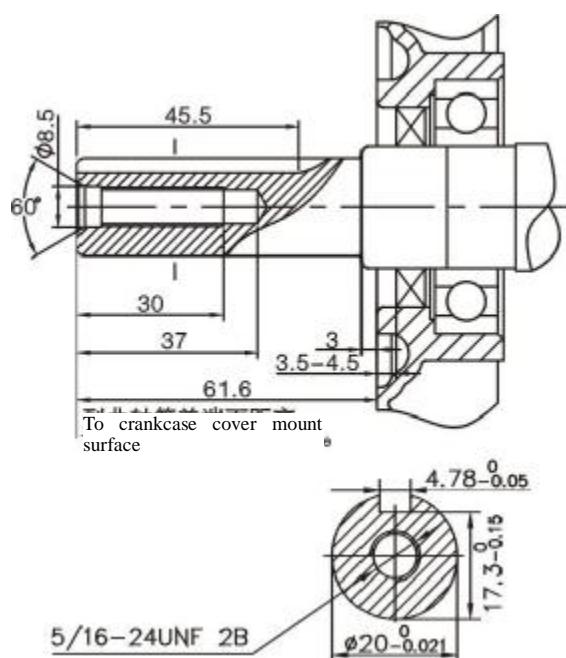
E Type



S Type



U Type



A22 Type

## 1-5 Wiring diagrams

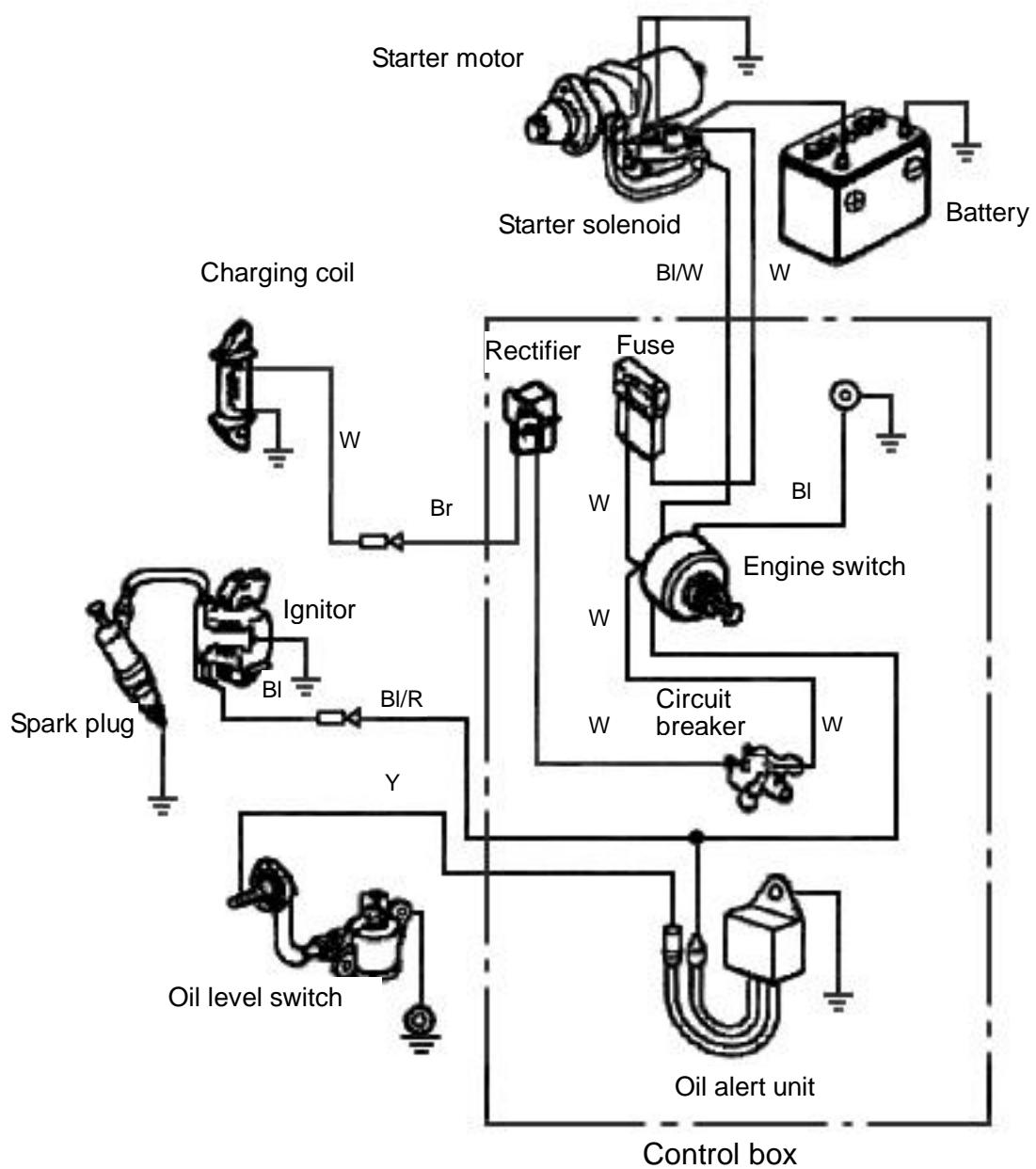
## Wire colors and codes

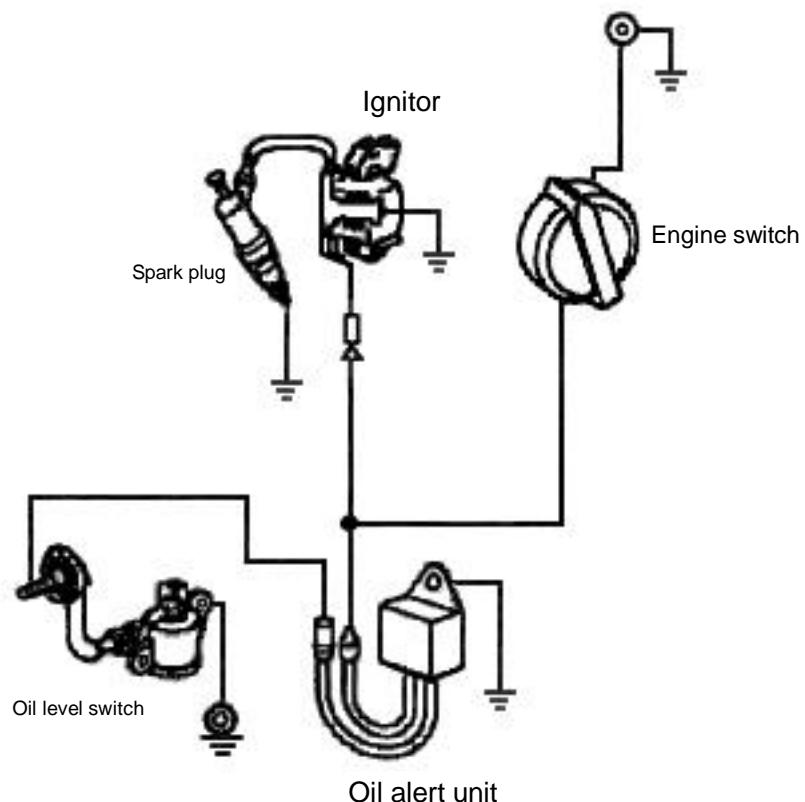
BI	Black	Br	Brown
Y	Yellow	R	Red
W	White	G	Green

## Combination switch

	IG	E	BAT	ST
OFF				
ON				
START				

## 1. With oil alert and electric starter



**2. With oil alert and without electric starter**

## 2-1. Safety precautions

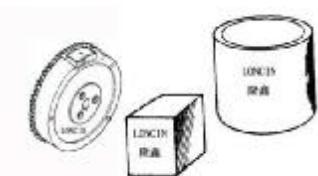
## 2-2. Maintenance standards

## 2-3. Torque values

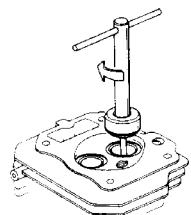
## 2-4. Troubleshooting

**2-1 Safety precautions**

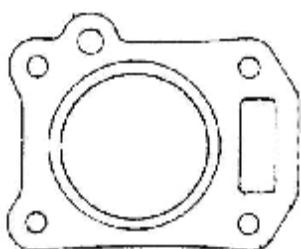
1. Parts, oil and grease must be genuine LONCIN products or products designated by Loncin



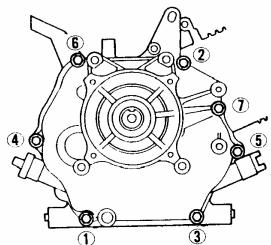
2. Work to be done with special tools must be done with such tools.



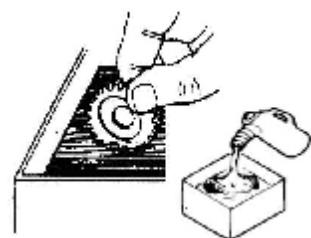
3. Gaskets, washers, O-rings and oil seals must be replaced after disassembly.



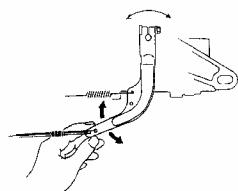
4. When screwing bolts, nuts or screws, begin with the larger-diameter inner one, and tighten in a crisscross pattern to the specified torque diagonally.



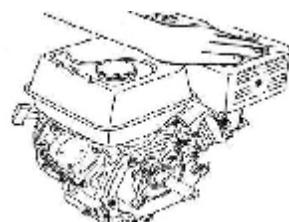
5. Clean parts in cleaning solvent upon disassembly. Lubricate any sliding surfaces before reassembly.



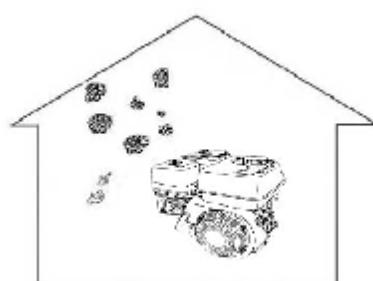
6. After reassembly, check all parts for proper installation and operation.



7. Don't maintain unless the engine is stopped and has cooled, otherwise, burn can happen in the hot state of engine.

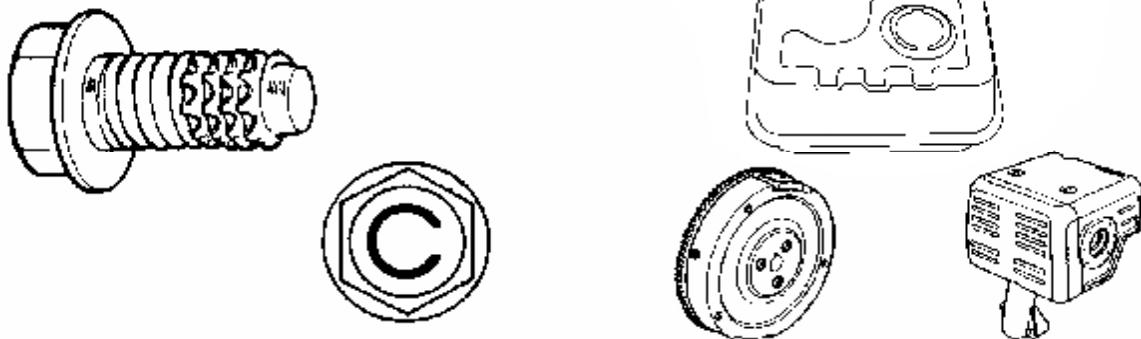


8. If you want to perform a test run of the engine in the work area after maintenance, take care to ensure adequate ventilation in the area, and never smoke or fire near fuel, grease or other flammable materials.



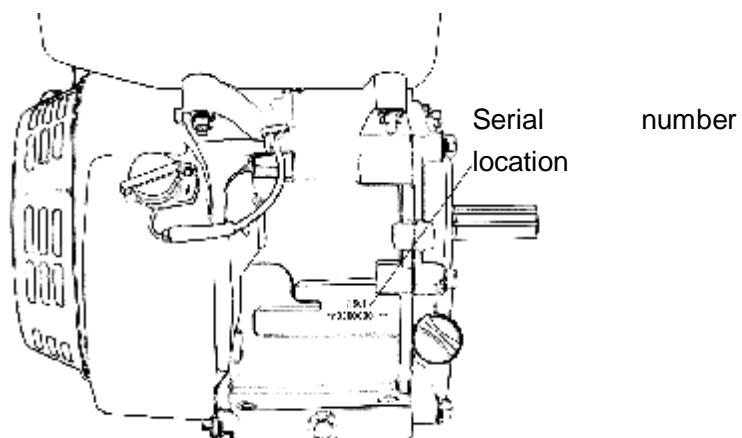
9. Self-tapping bolts (capable of tapping while being screwed in) are used for some portions of the engine; take care not to damage their threads. If thread of any of them is damaged, replace it with a standard bolt for the same hole.

10. Joint seams of the fuel tank are joined with adhesive, if you use local welding, the hot temperature may cause adhesive to fall off. If it is necessary to use welding, it must be performed for the whole circumference of joint seam. No treatment beyond specification may be performed on muffler, flywheel and other parts.



#### ● Serial number location

The engine's serial number, type and variant number are all stamped on the crankcase. You will need this information when ordering parts and when making technical or warranty inquiries.



## 2-2 Maintenance standards

## G120F

Part	Item	G120F	
		Standard	Service limit
Engine	Maximum speed	3850±150rpm	--
Cylinder	Cylinder bore	60.0mm	60.165mm
Cylinder head	Warpage	--	0.10mm
Piston	Skirt OD	59.985mm	59.845mm
	Piston-to-cylinder clearance	0.015-0.050mm	0.12mm
	Piston pin bore ID	13.002mm	13.048mm
	Piston pin OD	13.0mm	12.954mm
	Piston pin-to-piston pin bore clearance	0.002-0.014mm	0.08mm
Piston ring	Ring side clearance Top/second/oil	0.015-0.045mm	0.15mm
	Ring end gap: Top/second /oil	0.2-0.4mm	1.0mm
	Ring width: Top/second/ /oil	0.15-0.35mm	1.0mm
		1.5mm	1.37mm
Connecting rod	Small end ID	13.005mm	13.07mm
	Big end ID	26.02mm	26.066mm
	Big end oil clearance	0.040-0.063mm	0.12mm
	Small end side clearance	0.1-0.7mm	1.1mm
Crankshaft	Crankshaft OD	25.98mm	25.92mm
Valves	Valve clearance IN	0.15±0.02mm	--
	EX	0.20±0.02mm	--
	Stem OD IN	5.48mm	5.318mm
	EX	5.44mm	5.275mm
	Guide ID EX/IN	5.50mm	5.572mm
	Valve lifter clearance IN	0.02-0.044mm	0.1mm
	EX	0.06-0.087mm	0.12mm
	Seat width	0.8mm	2.0mm
Camshaft	Spring free length	30.5mm	29.5mm
	Cam height IN	27.7mm	27.45mm
	EX	27.75mm	27.50mm
Crankcase cover	Camshaft OD	13.984mm	13.916mm
	Camshaft holder ID	14.0mm	14.048mm
Spark plug	Gap	0.7-0.8mm	--
Ignition coil	Resistance Primary coil	0.8-1.0Ω	--
	Secondary coil	5.9-7.1kΩ	--
	Air gap (at flywheel)	0.4±0.2mm	--
Starter motor	Brush length	11.0mm	6mm
	Mica depth	1.6mm	1.1mm

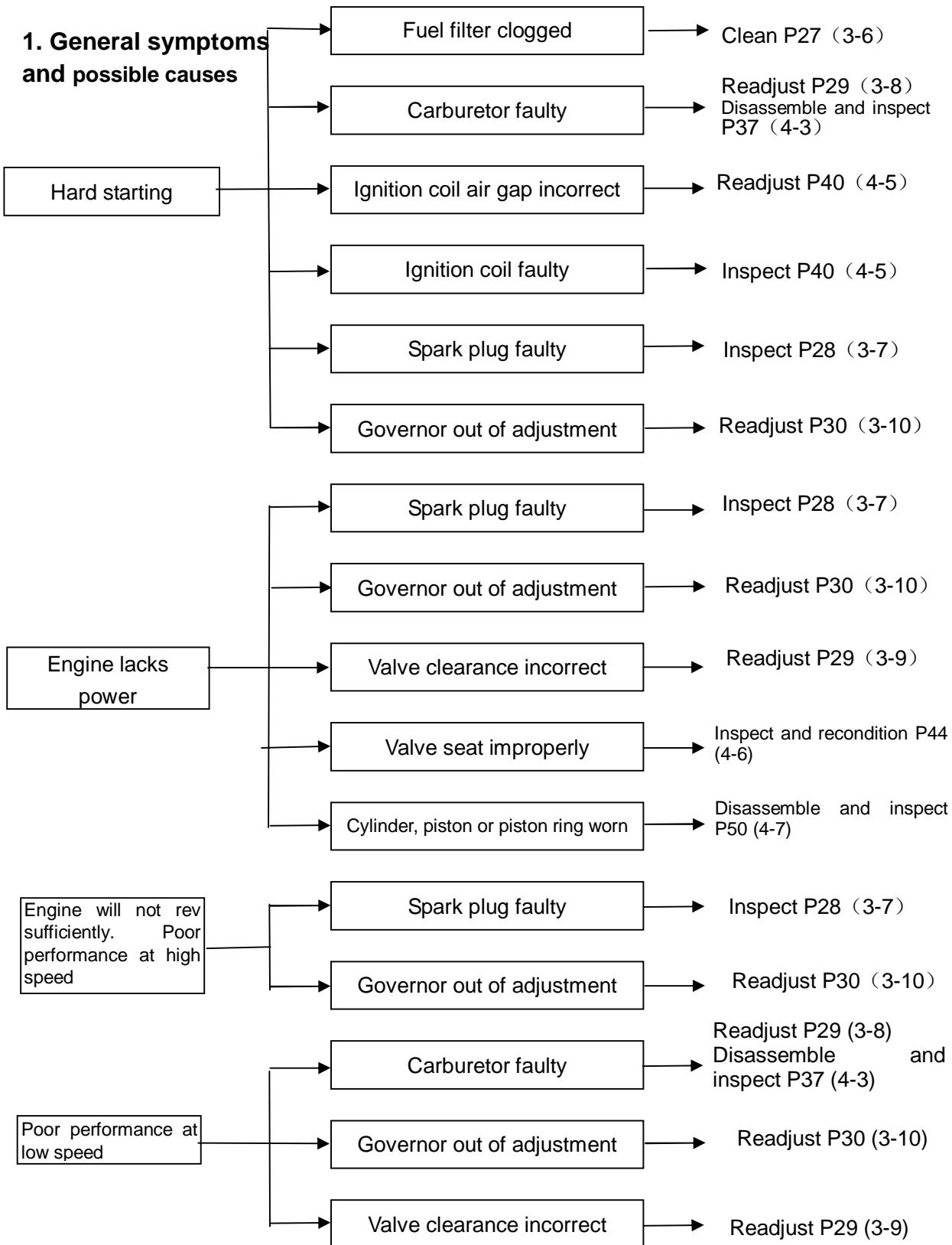
## G160F/G200F

Part	Item	G160F/G200F	
		Standard	Service limit
Engine	Maximum speed	3850±150rpm	--
Cylinder	Cylinder bore	68.0mm	68.165mm
Cylinder head	Warpage	--	0.10mm
Piston	Skirt OD	67.985mm	67.845mm
	Piston-to-cylinder clearance	0.015-0.05mm	0.12mm
	Piston pin bore ID	18 .002mm	18.048mm
	Piston pin OD	18.0mm	17.954mm
	Piston pin-to-piston pin bore clearance	0.002-0.014mm	0.06mm
Piston ring	Ring side clearance: Top/second oil	0.015-0.045mm --	0.15mm --
	Ring end gap: Top/second oil	0.2-0.4mm 0.15-0.35mm	1.0mm 1.0mm
	Ring width: Top/second oil	1.5mm 2.5mm	1.37mm 2.37mm
Connecting rod	Small end ID	18.002mm	18.07mm
	Big end ID	30.02mm	30.066mm
	Big end oil clearance	0.040-0.063mm	0.12mm
	Small end side clearance	0.1-0.7mm	1.1mm
Crankshaft	Crankpin OD	29.98mm	29.92mm
Valves	Valve clearance IN	0.15±0.02mm	--
	EX	0.20±0.02mm	--
	Stem OD IN	5.48mm	5.318mm
	EX	5.44mm	5.275mm
	Guide ID EX/IN	5.50mm	5.572mm
	Valve lifter clearance IN	0.02-0.044mm	0.1mm
	EX	0.06-0.087mm	0.12mm
Camshaft	Seat width	0.8mm	2.0mm
	Spring free length	30.5mm	29.5mm
Camshaft	Cam height IN	27.7mm	27.45mm
	EX	27.75mm	27.50mm
	Camshaft OD	13.984mm	13.916mm
Crankcase cover	Camshaft holder ID	14.0mm	14.048mm
Spark plug	Gap	0.7-0.8mm	--
Ignition coil	Resistance Primary coil	0.8-1.0Ω	--
	Secondary coil	5.9-7.1kΩ	--
	Air gap (at flywheel)	0.4±0.2mm	--
Starter motor	Brush length	11.0mm	6.0mm
	Mica depth	1.6mm	1.1mm
Reduction with a 1/2 clutch	Friction disc thickness	3.5mm	3.0mm

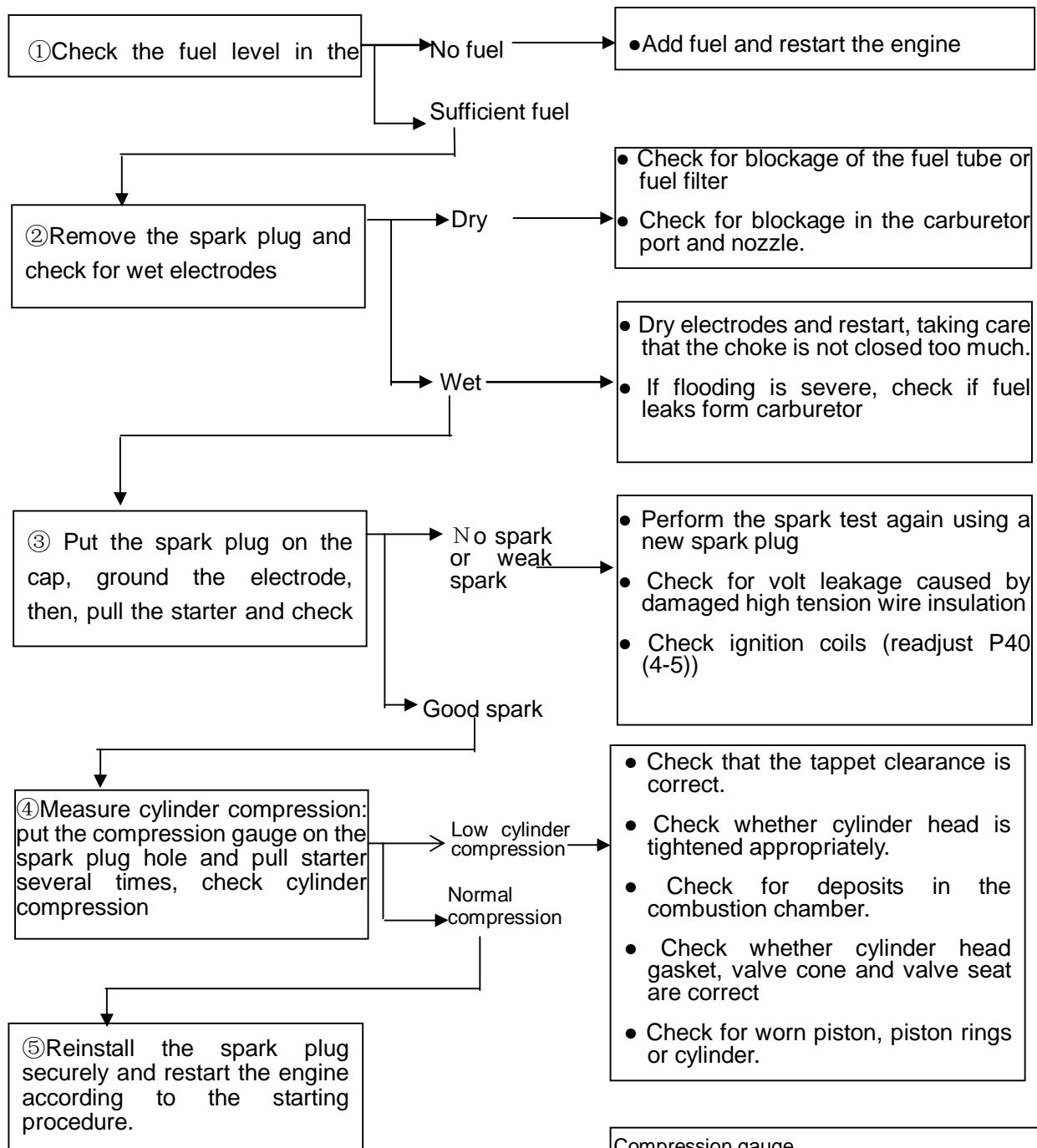
## 2-3 Torque values

Item	G120F/G160F/G200F	
	Thread dia.×pitch	Tightening torque (N·m)
Connecting rod bolt	M7×1	12-14
Cylinder head bolt	M8×1.25	32-35
Flywheel bolt	M14×1.5	80-90
Valve lock nut	M6×0.75	12-16
Valve adjusting bolt	M8×1.25	26-32
Crankcase cover bolt	M6×1(G120F) M8×1.25(G160F/G200F)	8-12 27-30
Crankcase oil drain bolt	M10×1.25	25-30
Spark plug		27-30
Oil level switch nut	M10×1.25	6-8
Muffler mounting nut	M8×1.25	27-30
Air cleaner wing nut	M6×1	7-10
Air cleaner mounting nut	M6×1	8-12
Standard torque values	M5 bolt, nut	4-7
	M6 bolt, nut	8-12
	M8 bolt, nut	20-28
	M10 bolt, nut	35-40
	M12 bolt, nut	50-60

## 2-4 Troubleshooting

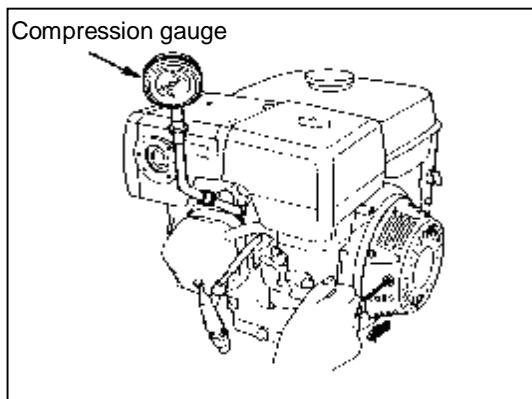


## 2. Hard starting



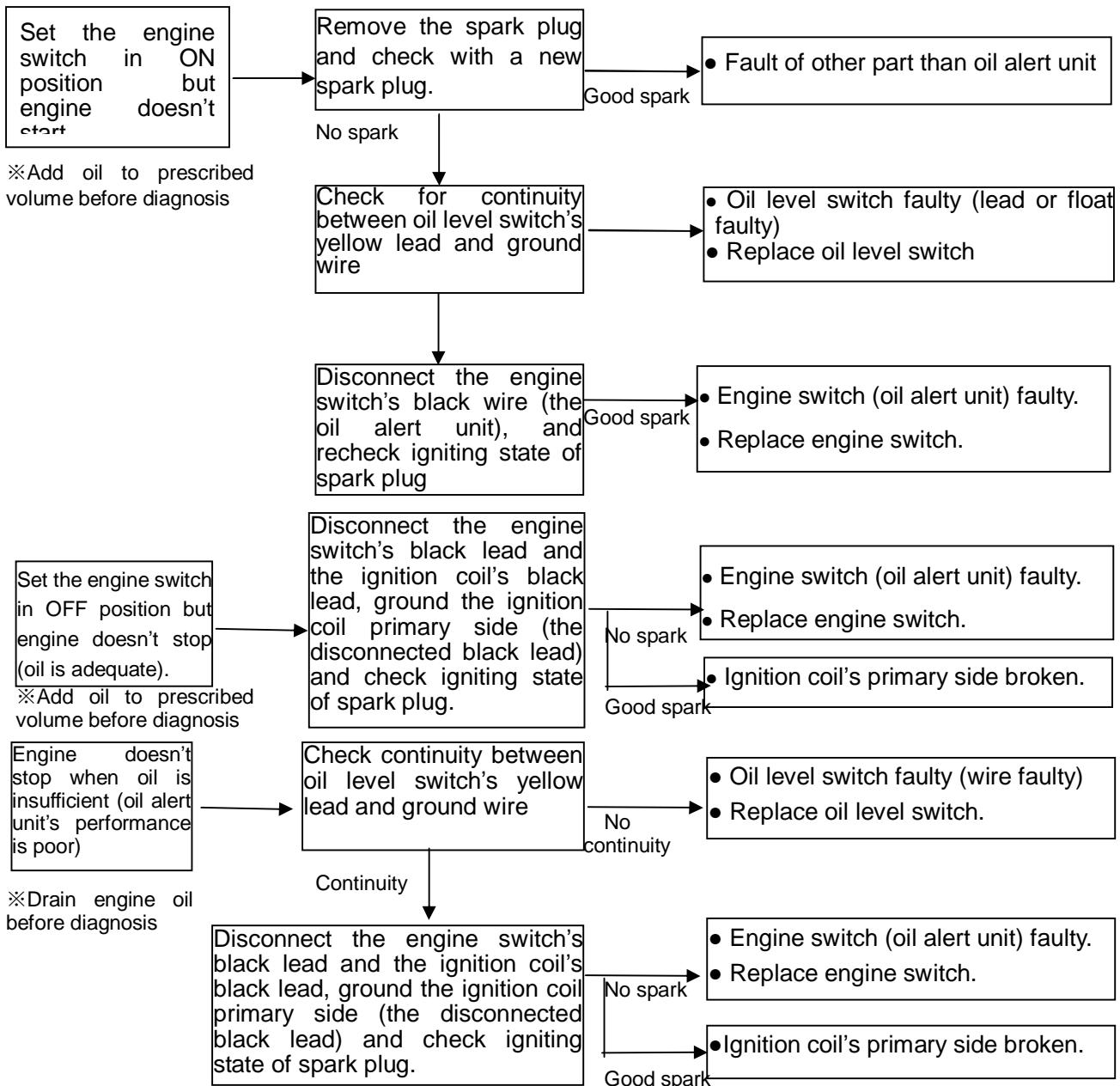
### Cylinder compression check

- 1) Remove spark plug cap and spark plug.
- 2) Install a compression gauge in the spark plug hole, crank the engine several times with the recoil starter and measure cylinder compression

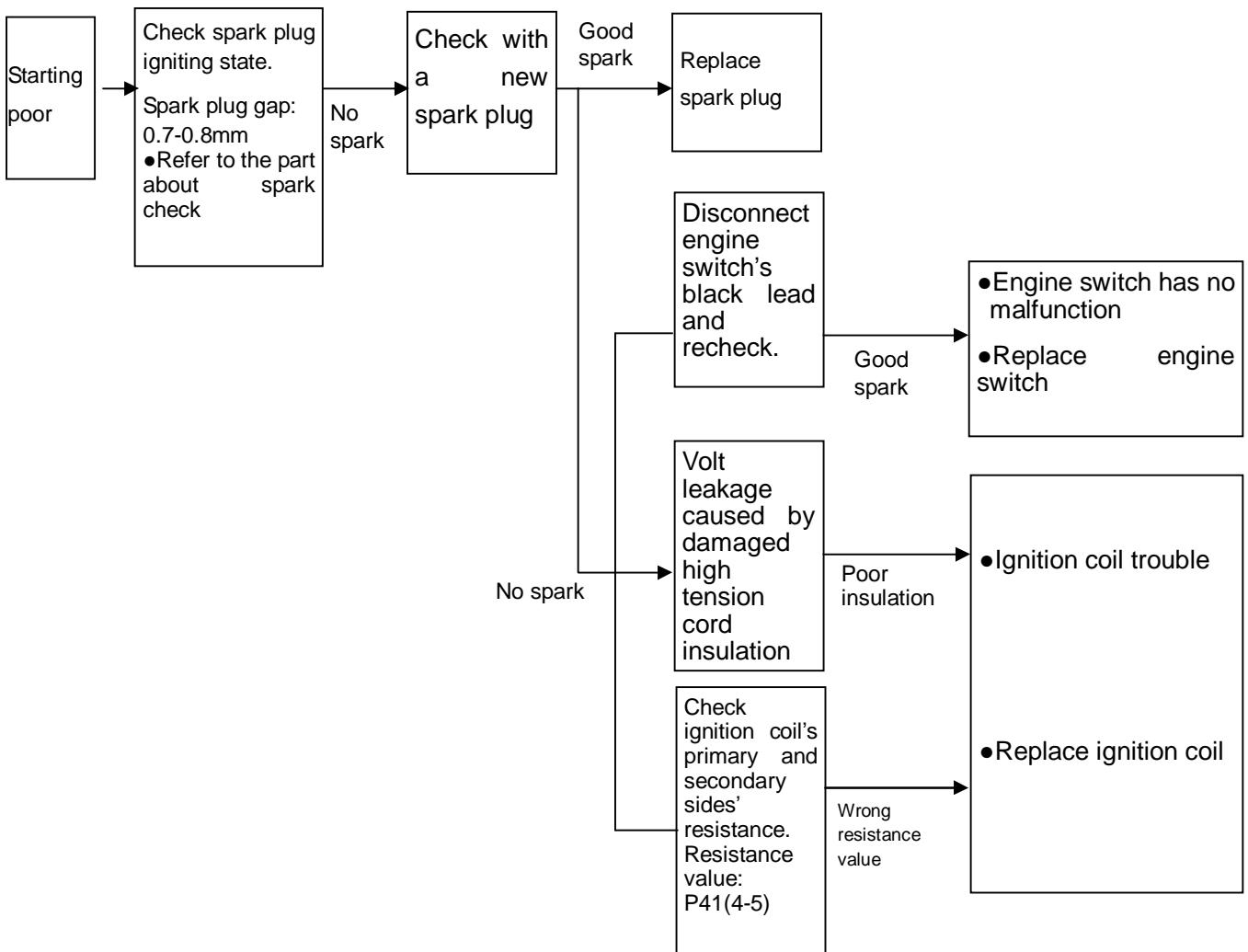


Compression	6.0~8.5kg/cm <sup>2</sup> (600rpm)
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### 3. Troubleshooting with oil alert unit installed on the engine



#### 4. Troubleshooting for no spark plug at spark plug

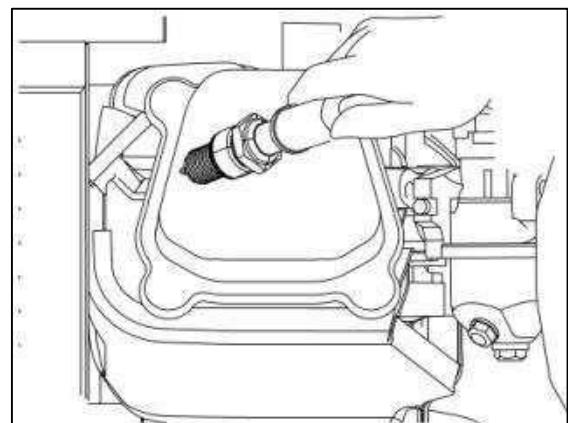


##### Checking spark

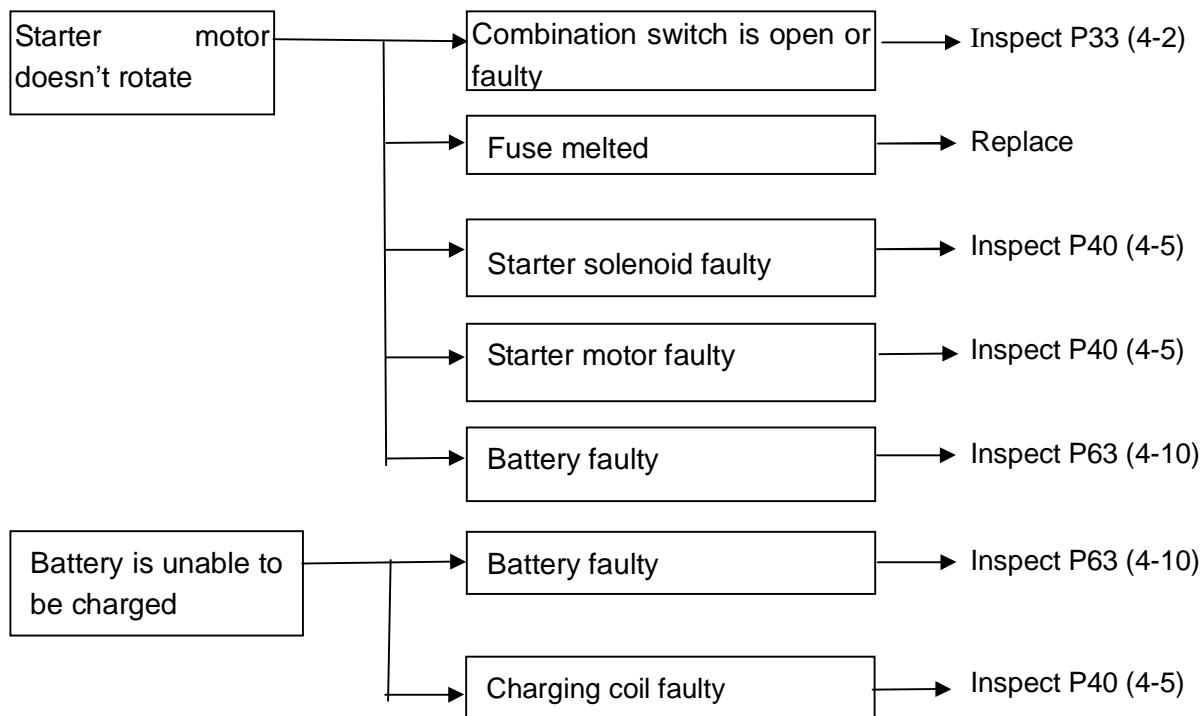
Ensure there is no spilled fuel outside the gasoline engine and spark plug is not wetted by fuel.

In order to prevent fire, don't let any spark near spark plug hole. Don't grab spark plug's high tension wire by wet hand when testing spark plug.

- Set fuel cock to “OFF” position and drain fuel out of the carburetor when operating.
- Remove spark plug cap and spark plug.
- Pull starter grip and drive the unburned gas out of the cylinder.
- Install the spark plug cap
- Set gasoline engine switch to ON position.
- Ground spark plug's negative electrode (threaded section) via cylinder head; pull starter grip and observe spark-producing state.



## 5. Troubleshooting for hard electric starting



3-1. Maintenance schedule	3-2. Engine oil	3-3. Oil alert system inspection
3-4. Air cleaner	3-5. Muffler	3-6. Fuel filtering system
3-7. Spark plug	3-8. Carburetor (idle speed)	3-9. Valve clearance
3-10. Governor		

### 3-1 Maintenance schedule

Maintenance schedule		Each use	First month or 20 hrs	Every 3 months or 50 hrs	Every 6 months or 100 hrs	Every year of 300 hrs
Engine oil	Check level	○				
	Replace		○		○	
Air filter	Check	○				
	Clean			○(1)		
	Replace					○*
Fuel strainer cup	Clean				○	
Battery electrolyte level	Check	○				
Spark plug	Clean				○	Replace
Valve clearance	Readjust					○(2)
Combustion chamber	Clean		Every 300 hours (2)			
Fuel tank and strainer	Clean		Every 2 years (2)			
Fuel tube	Replace		Every 2 years (2)			

○ Maintenance items:

\* Replace foam and paper elements only

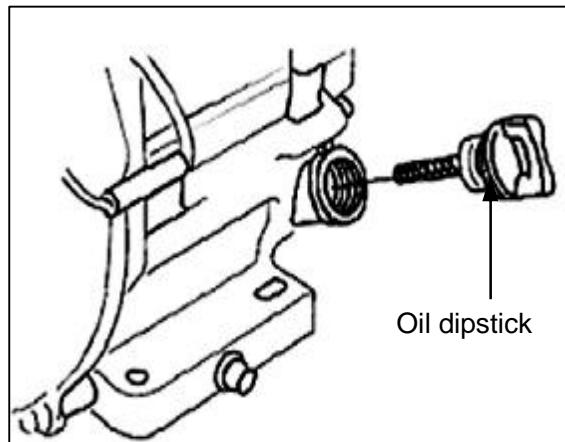
(1) Service more frequently when used in the dusty areas.

(2) These items are to be maintained by Loncin's designated dealers unless the user has special tools and skills for maintenance.

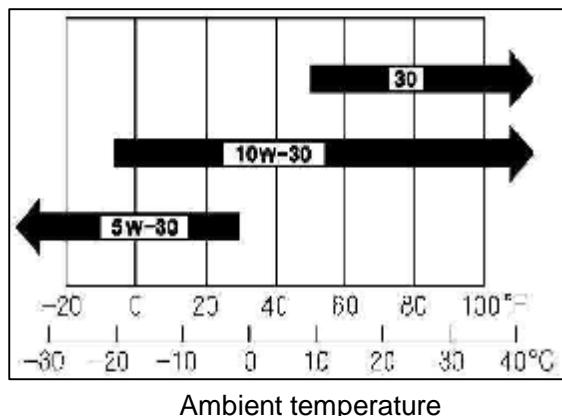
When the engine is used frequently, only maintenance as per the above schedule can ensure long and normal performance of the engine.

### 3-2 Engine oil

- Oil is the major factor affecting performance and service life. Don't use oil containing additives and 2-stroke engine oil, because they lack sufficient lubricating ability and will shorten the gasoline engine's service life.
- Check the oil level with the engine stopped and on a flat level surface.
- Oil capacity: 0.60 L

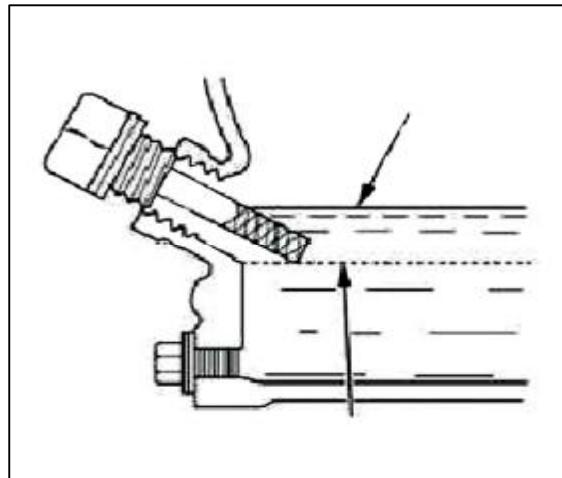


In order to obtain the best performance of the engine, it is recommended to use special engine oil certified to be OK for Loncin engines. SAE 10W-30 is the recommended oil. Other viscosities shown in the chart may be used when the average temperature in your area is within the recommended range.



#### Oil level check:

- 1) Remove the oil cap/dipstick and wipe it clean.
- 2) Insert the oil dipstick into oil filler neck but do not screw it in, and check oil level.
- 3) Oil level is too low if there is no oil on the dipstick. Add recommended oil to bring the oil level to the upper limit of the dipstick.
- 4) Reinstall the cap/ dipstick securely.



#### WARNING

- Used engine oil contains carcinogenic substances. If repeatedly left in contact with the skin for prolonged periods, it may cause skin cancer. Wash your hands thoroughly with soap and water as soon as possible after contact with used engine oil.

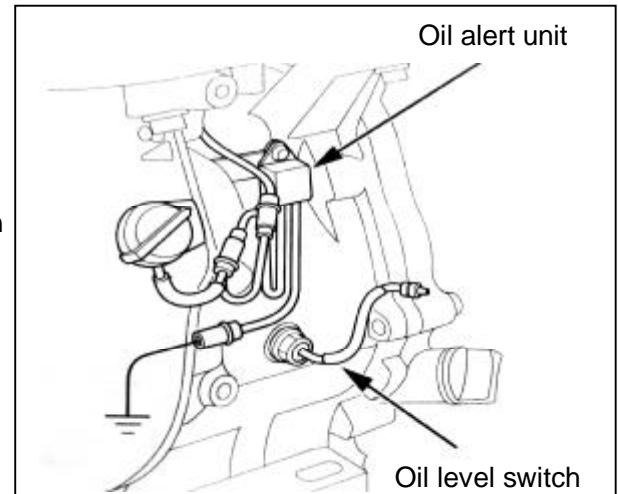
**NOTICE**

**•Please dispose of used engine oil and the oil containers in a manner that is compatible with the environment. We suggest that you take it in a sealed container to your local waste disposal site or service station for reclamation. Do not throw it in the trash; pour it on the ground, or down a drain.**

### 3-3 Oil alert system inspection

Oil alert system is specially designed to protect engine from damage by insufficient oil in the crankcase. Before the oil level in the crankcase can fall below a safe limit, the oil alert system will automatically shut down the engine (the engine switch will remain in the ON position). The oil alert system shuts down the engine and the engine will not start. If this occurs, first check engine oil level, then check for other faults.

- 1) With the engine running, disconnect the engine switch's yellow lead and ground it to the engine, the engine should stop.
- 2) With the engine stopped, engine oil level within the specified range and two leads of oil level switch not disconnected, there should be continuity between the two leads.
- 3) Then check with engine oil drained off. There should be continuity between leads of oil level switch.



### 3-4 Air cleaner

A dirty air filter will restrict air flow to the carburetor, reducing engine performance. If the engine is operated in dusty areas, clean the air cleaner more often than specified in the MAINTENANCE SCHEDULE.

#### **WARNING**

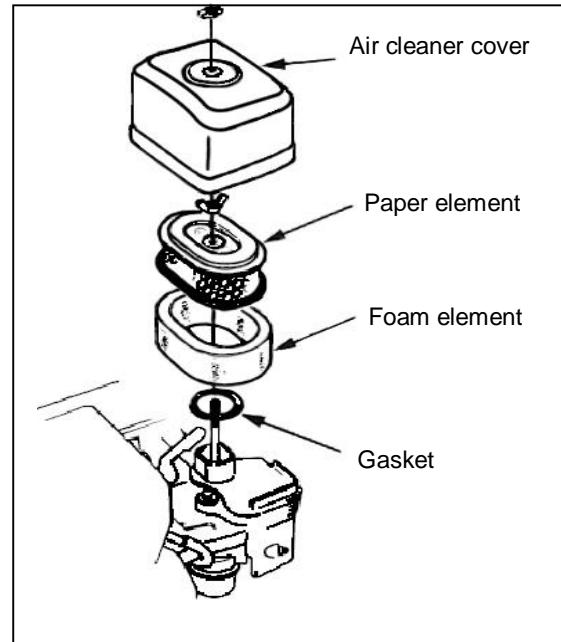
Washing filter element with gasoline or flammable solvents may cause fire or explosion, please use soapy water or nonflammable solvent.

#### **NOTICE**

Operating the engine without an air filter element or with a damaged air filter will allow dirt to enter the engine, causing rapid engine wear.

#### 1. Dual-filter-element air cleaner

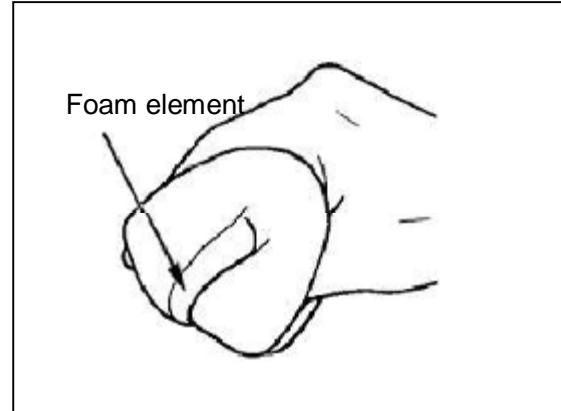
- 1) Remove the wing nut and air cleaner cover.
- 2) Remove the wing nut and take out paper element and foam element.
- 3) Remove the foam filter from the paper filter.
- 4) Check both filter elements and replace them if they are damaged. Normally paper element may be replaced at the scheduled maintenance interval.



#### Clean paper element:

Tapping paper element several times and then blow compressed air (at no more than 207KPa) through the filter from the inside. Never try to brush off dirt.

Brushing will force dirt into the filter fibers.



#### Cleaning foam element:

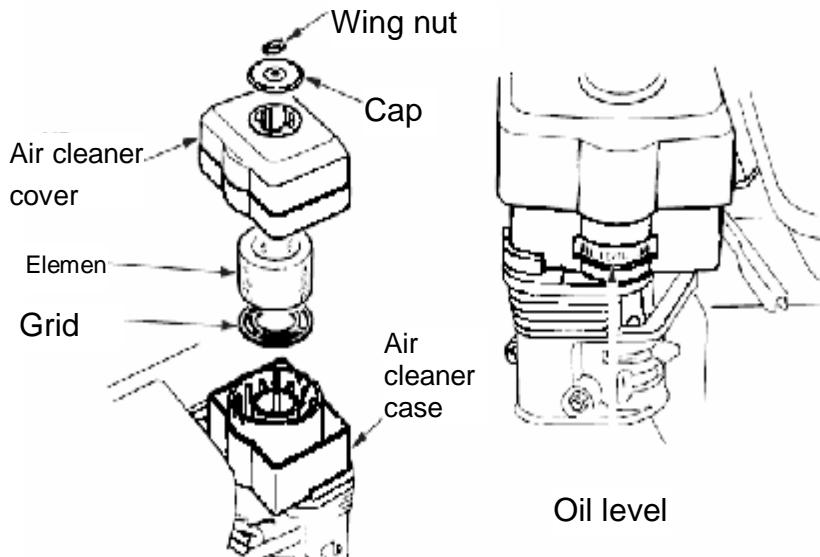
Clean the foam element in warm water with detergent, or in a nonflammable or high flash point solvent and allow it to dry, then soak the air filter element in clean engine oil and squeeze out the excess oil.

- 5) Clean air cleaner case, cover and rubber gasket, and be careful to prevent dirt from entering the air duct that leads to carburetor.

- 6) Place the foam air filter element over the paper element, and reinstall the assembled air filter. Be sure the gasket is in place beneath the air filter; then tighten the wing nut securely.
- 7) Install the air cleaner cover and tighten the wing nut securely.

## 2. Oil batch air cleaner

- 1) Remove wing nut, air cleaner cover and cap, and take out element.
- 2) Wash the element in a solution of household detergent and warm water, then rinse thoroughly, or wash in non-flammable or high flash point solvent. Allow the element to dry thoroughly. Soak the air filter element in clean engine oil and squeeze out the excess oil.
- 3) Rinse air cleaner cover and cap in warm water with detergent and allow them to dry thoroughly.
- 4) Empty the used oil from the air cleaner case and wash out any accumulated dirt with nonflammable solvent, and dry the case.
- 5) Fill the air cleaner case to the OIL LEVEL mark with the same oil that is recommended for the engine. Oil capacity: 60 cc.
- 6) Reinstall the air cleaner parts and tighten the wing nut securely.

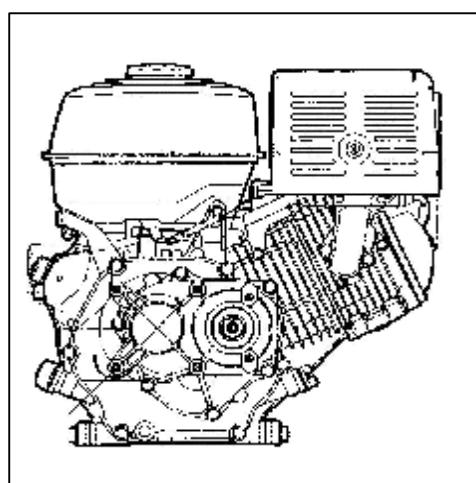


## 3-5 Muffler

Carbon will deposit on muffler after a long period of use, and severely affect the exhaust system. In order to ensure better performance of the exhaust system, we normally have to remove carbon deposit from the muffler.

For removing the carbon deposit, we can gently knock the muffler with a hand hammer, and use compressed air to blow it.

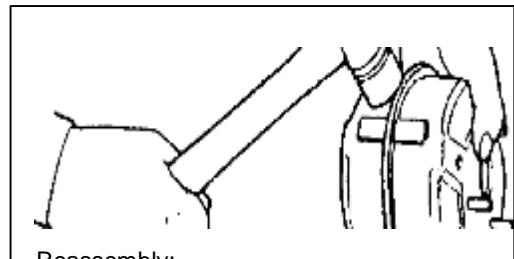
If the muffler has water drop deposit, or is severely eroded, which causes higher exhaust noise, it shall be replaced with a new one.



**NOTICE**

Never use iron wires to clean the muffler, or the sound insulation, or the acoustical absorbing material will be scraped away and muffler's performance will be lowered.

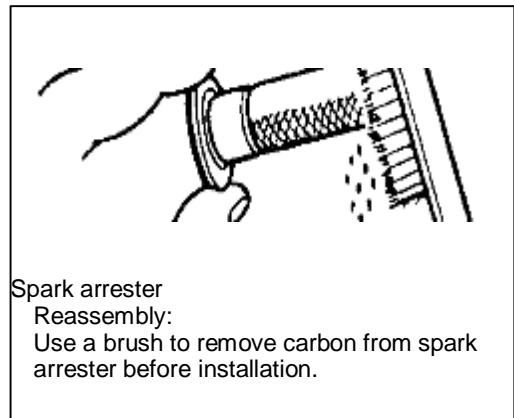
Muffler's seal washer cannot be used repeatedly.



Reassembly:  
Gently knock with a plastic hammer to remove carbon deposits in it before installation

**WARNING**

- The muffler will heat up, please install the gasoline engine in a place inaccessible to passers-by and children.
- When the gasoline engine is running, never put any flammable material near the exhaust port.

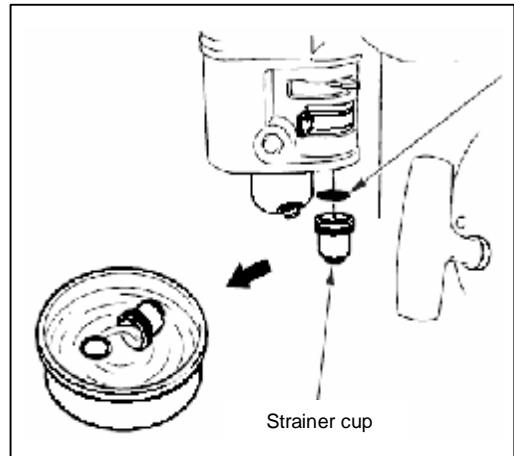


Spark arrester  
Reassembly:  
Use a brush to remove carbon from spark arrester before installation.

**3-6 Fuel filtering system**

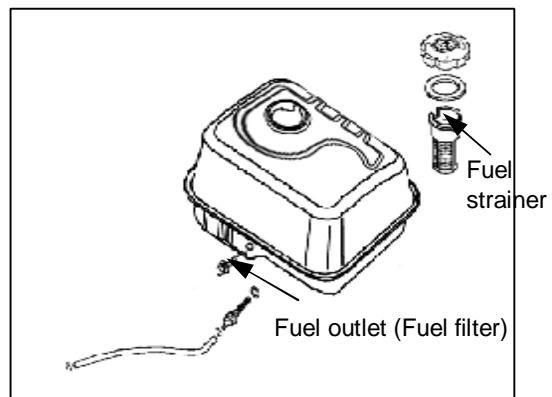
No smoking or flame is allowed during cleaning of the fuel check to ensure no fuel leaks after tightening.

Clean sediment cup and O-ring in nonflammable solvent and allow them to dry thoroughly.



Open the fuel cock, if there is any leak, replace the O-ring.

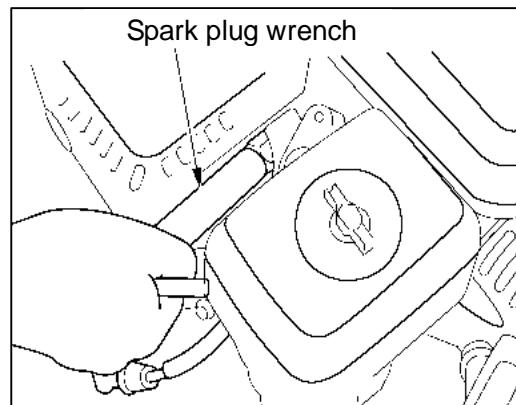
Clean the fuel filter element and strainer; remove the deposits on the strainer and check if its meshes are damaged, if so, replace it.



### 3-7 Spark plug

Recommended types: F7RTC or equivalent types.

Spark plugs of the wrong type can lower engine performance and cause engine damage



1) Remove the spark plug cap.

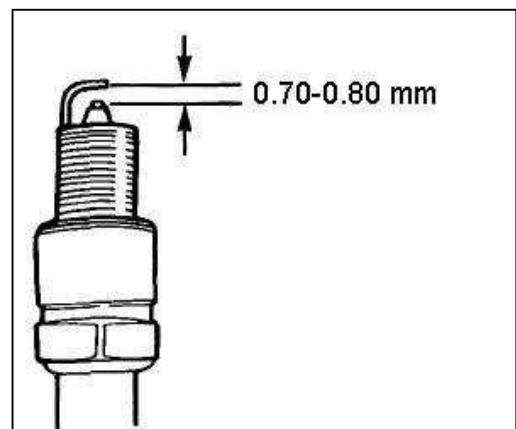
2) Remove the spark plug with a spark plug wrench.

3) Visually inspect whether the insulator is cracked or chipped, if so, replace it with a new one, if there are excessive deposits on it; clean it with a wire brush.



4) Measure the electrode gap with a feeler gauge. The correct gap is 0.70-0.80mm (0.028 - 0.031 in). If necessary, adjust the gap by carefully tapping (for a too big gap) the electrode or gently forcing up (for a too small gap) the electrode using a slotted screwdriver.

5) Make sure the spark plug's sealing washer is in a good condition.

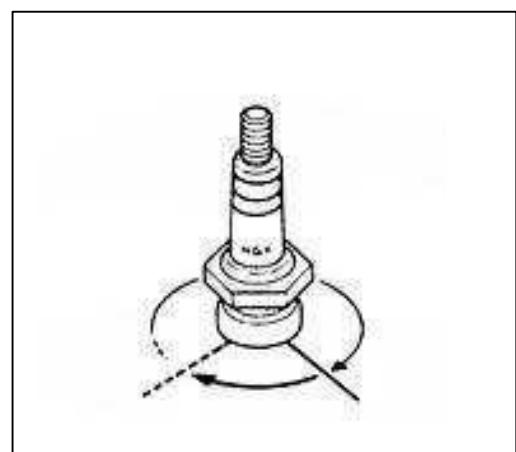


6) Install the spark plug and use a spark plug wrench to tighten it into the cylinder head.

7) When installing the spark plug, in order to prevent cross-threading, first use hand to screw it in the direction as shown by the arrow to install it into the tapped hole in the cylinder head, then tighten with a plug wrench to compress the sealing washer.

8) If installing a new spark plug, tighten 1/2 turn after the spark plug seats.

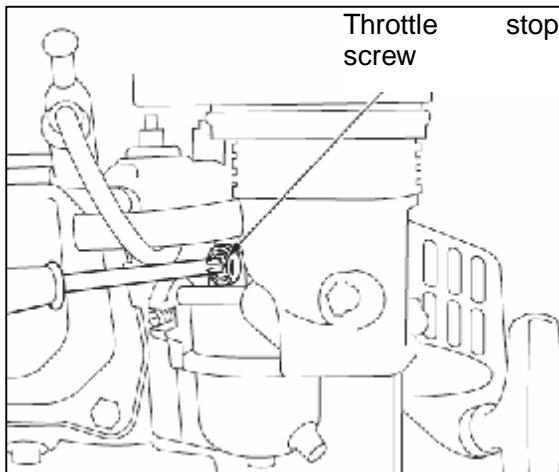
9) If reinstalling the used spark plug, tighten 1/8-1/4 turn after the spark plug seats.



### 3-8 Carburetor (idle speed)

- 1) Start the engine and allow it to warm up for about 10 minutes.
- 2) Set the throttle lever in the position for lowest speed.
- 3) Use tools to adjust the throttle stop screw, to bring the idle speed within the range of standard idle speed.

Standard idle speed:  $1400\pm150\text{rpm}$ .

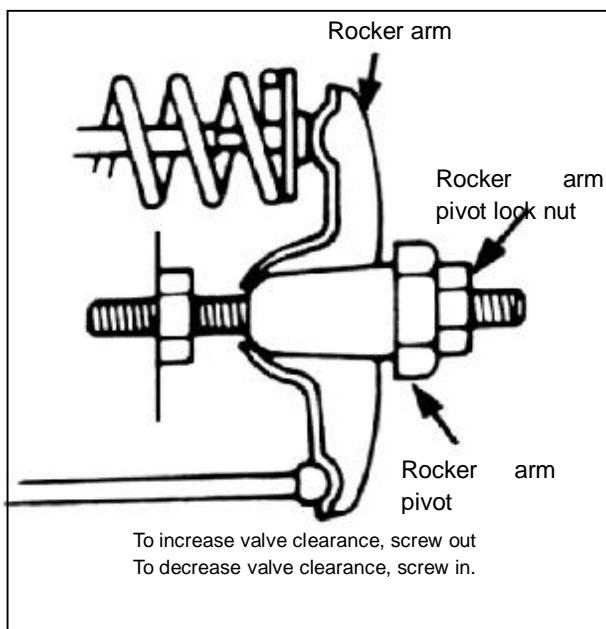
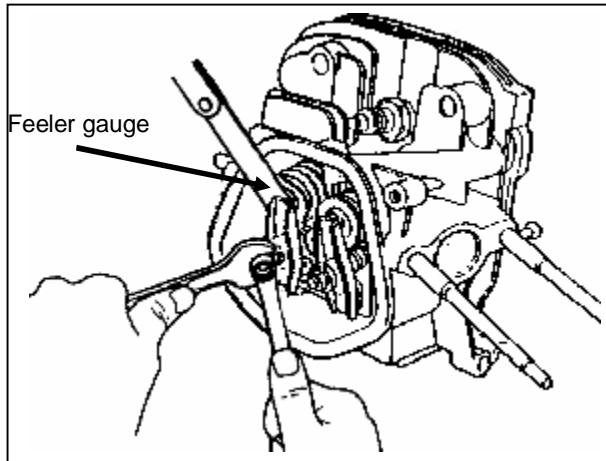


### 3-9 Valve clearance

Valve clearance inspection and adjustment must be performed with the engine cold.

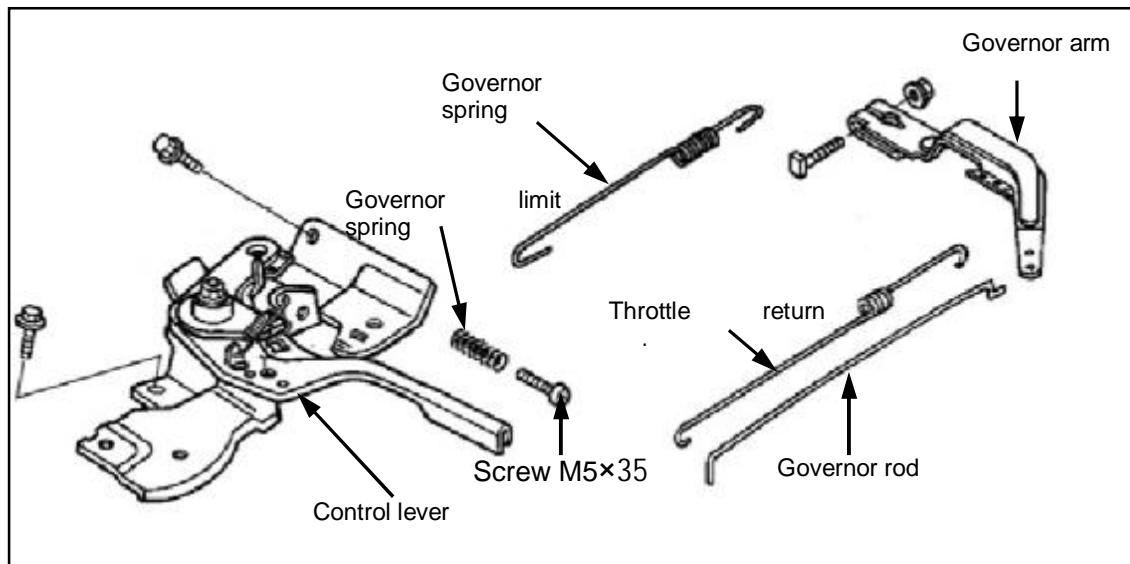
- 1) Remove the cylinder head cover bolt, cylinder head cover and gasket.
- 2) Set the piston at top dead center (both valves fully closed). The position of the flywheel's magnet corresponding to the front face of the ignitor is the timing point.
- 3) Insert a feeler gauge between the rocker arm and valve to measure valve clearance.
- 4) If adjustment is necessary, proceed as follows:

Valve clearance	IN	$0.15\pm0.02\text{mm}$
	EX	$0.20\pm0.02\text{mm}$



- a. Hold the rocker arm pivot with a wrench and loosen the pivot lock nut.
- b. Loosen the rocker arm pivot and turn the rocker arm pivot to obtain the specified valve clearance.
- c. Hold the rocker pivot with a wrench and tighten the lock nut.
- d. Recheck the valve clearance after tightening the lock nut.

### 3-10 Governor



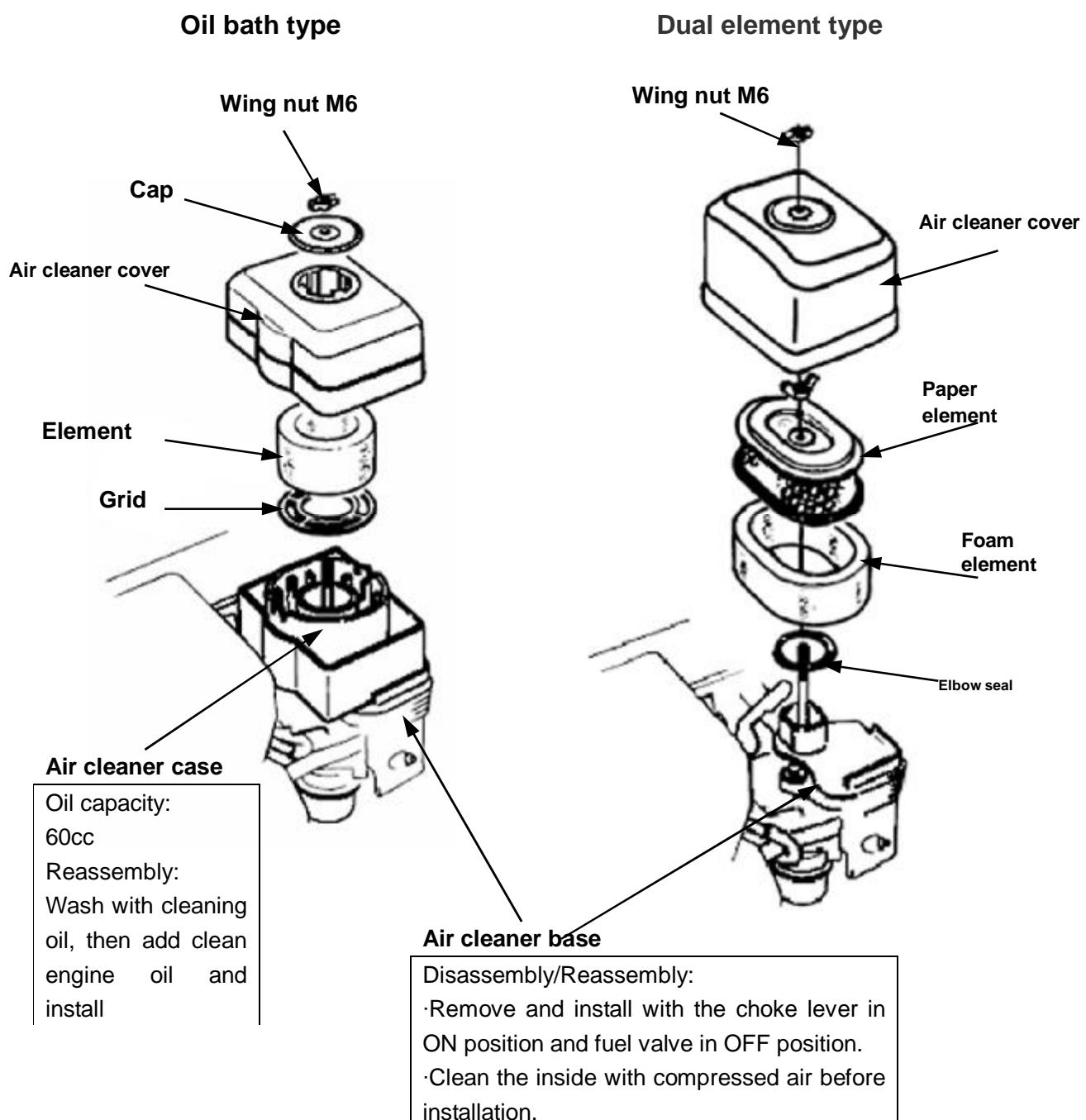
- 1) Remove the fuel tank.
- 2) Loosen the hexagon flange nut (M6) of the pointless lag lock screw to move the governor arm to fully open the throttle.
- 3) Press on the governor arm at the position where the throttle is fully open and rotate the governor arm clockwise as far as it will go (to the position where governor is fully closed), then tighten the nut.
- 4) Check whether governor support and throttle valve move freely.
- 5) Check and adjust the gasoline engine's maximum no-load speed.
  - a. Start the gasoline engine and allow it to warm up for about 10 minutes.
  - b. If the gasoline engine's maximum no-load speed is not as specified, adjust the cross recessed pan head screw M5x35.

Gasoline engine's maximum no-load speed	3,850 ± 150 rpm
Speed too high	Adjust the adjusting screw counterclockwise
Speed too low	Adjust the adjusting screw clockwise

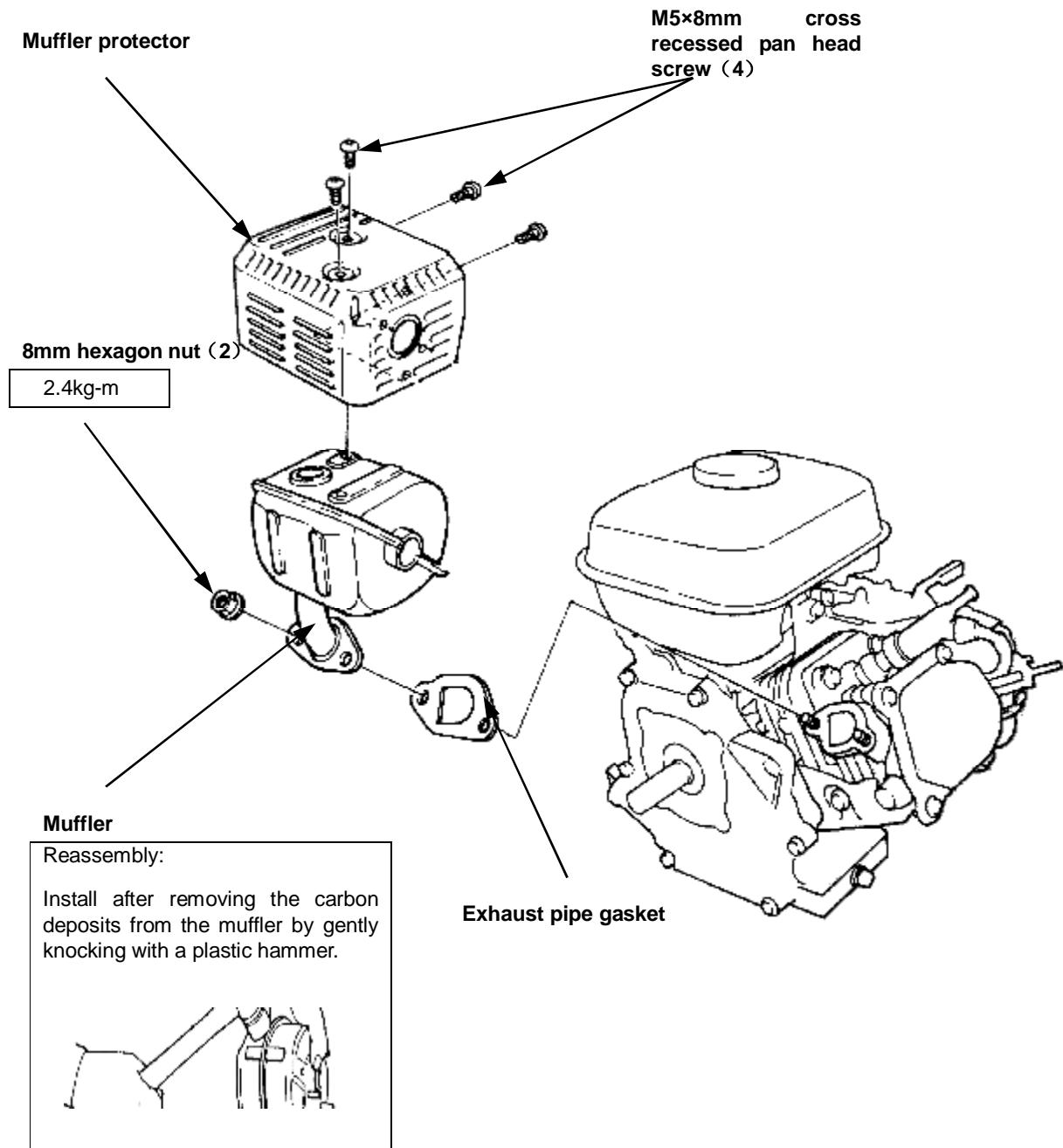
4-1. Air cleaner and muffler	4-2. Starter and control box	4-3. Carburetor
4-4. Fuel tank and speed governing system	4-5. Flywheel, ignition coil, starter motor and lighting coil	
4-6. Cylinder head and valves	4-7. Crankcase body, piston, connecting rod and crankshaft	
4-8. Governing gear and fuel level switch	4-9. Reduction system	

#### 4-1. Air cleaner and muffler

##### 1. Disassembly/reassembly of air cleaner

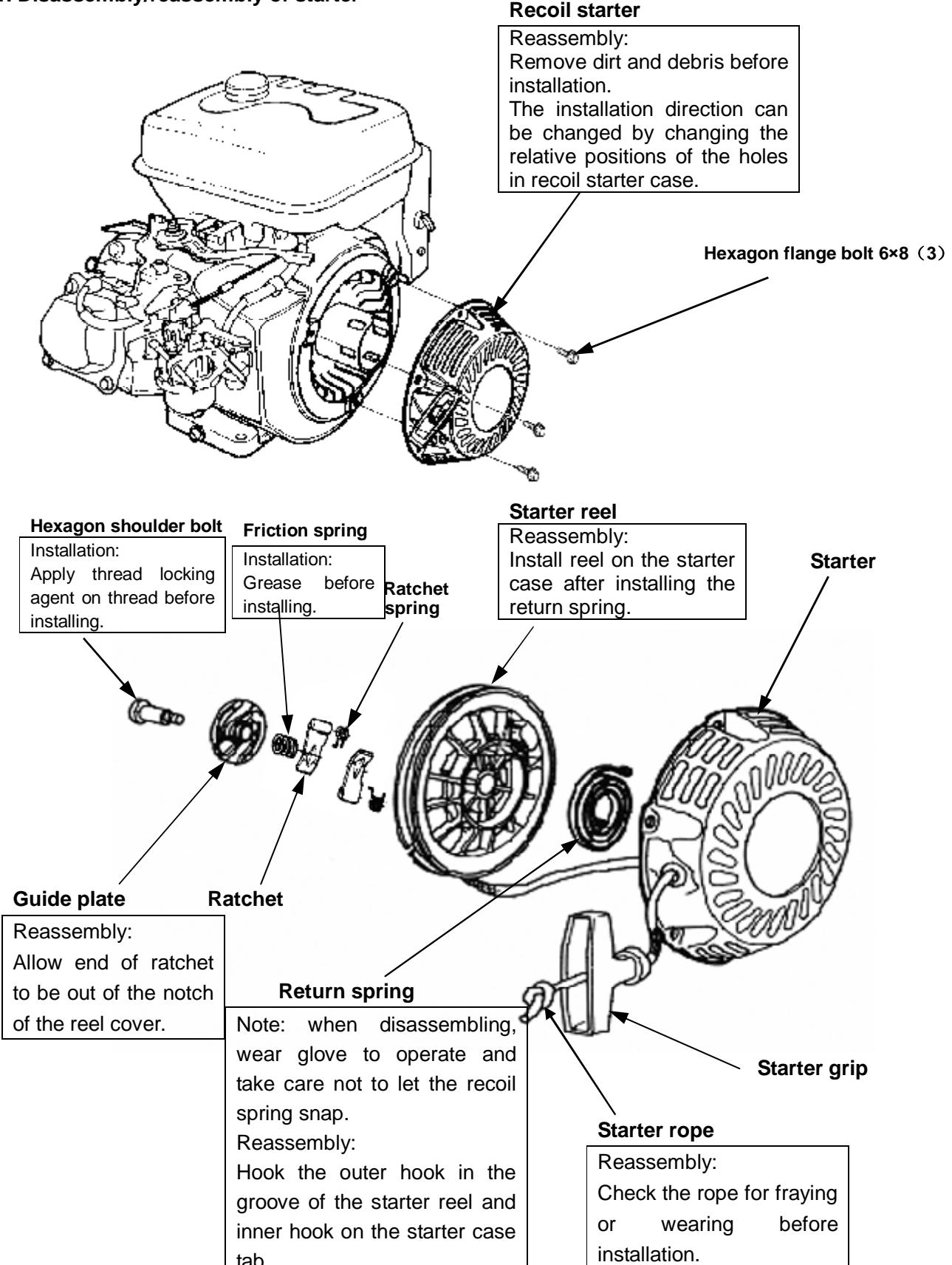


## 2. Disassembly/reassembly of muffler



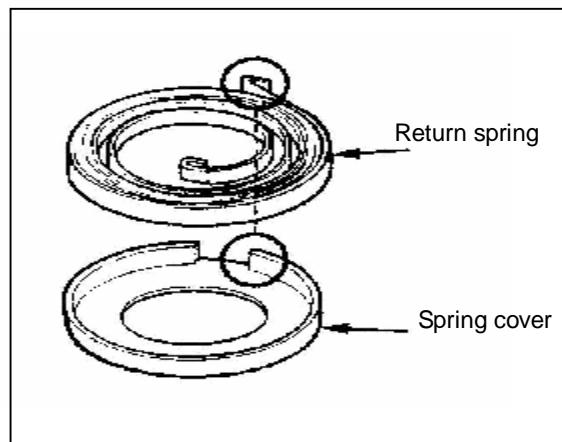
## 4-2. Starter and control box

### 1. Disassembly/reassembly of starter

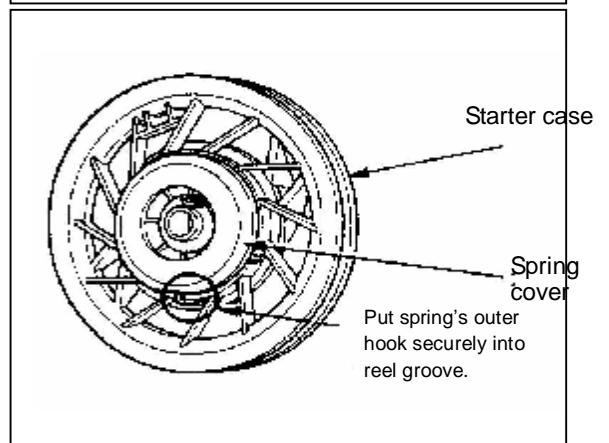


### Reassembly steps

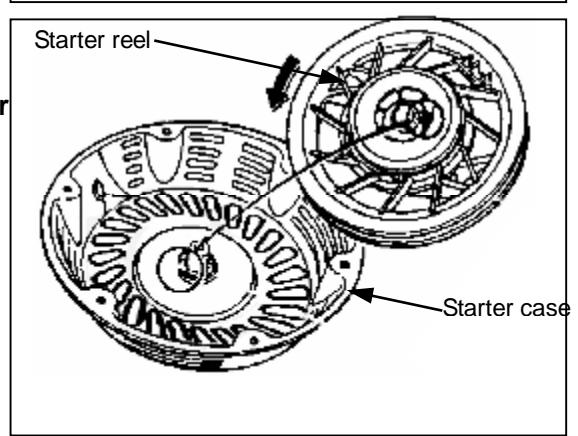
1) Wind the spring into the cover and hook spring's outer hook to the notch of the spring cover.



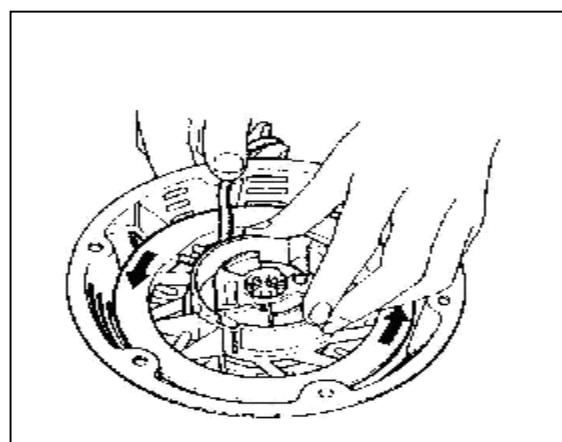
2) Align the spring's outer hook with reel's groove, and install the cover onto the reel.



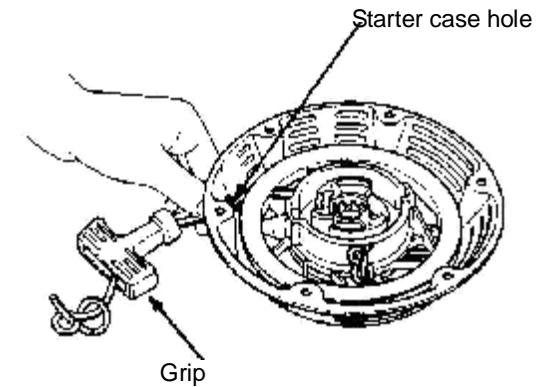
3) Grease the tab on the starter case. Install the starter reel and turn the starter reel leftward to hook the inner hook to the tab on the starter case.



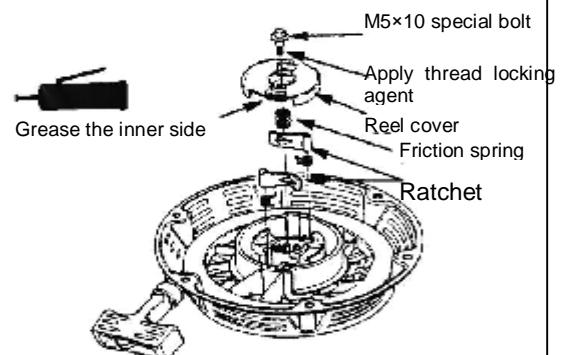
4) Make a figure eight knot at the rope end, feed the other end through starter reel's rope hole and pull the rope out of the hole by a certain length. Then turn starter reel counterclockwise five turns.



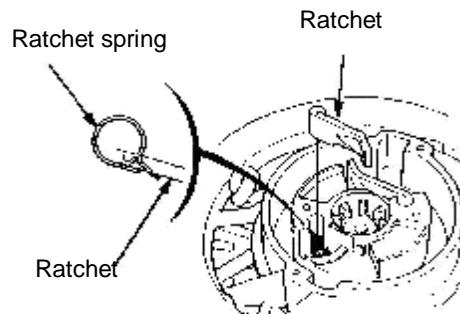
5) Feed the rope through the starter case hole and the starter grip; then make a figure eight knot at the rope end.



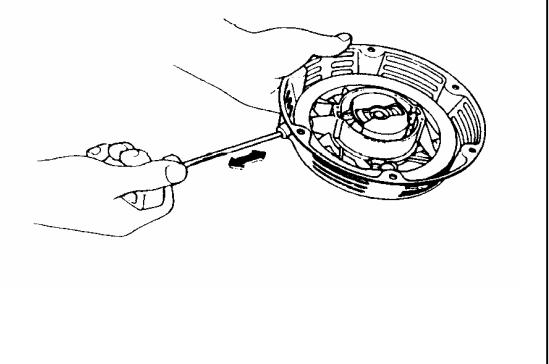
6) Assemble the ratchets and then tighten them with special bolts.

**NOTICE**

Pay special attention to the installation direction of the ratchets.

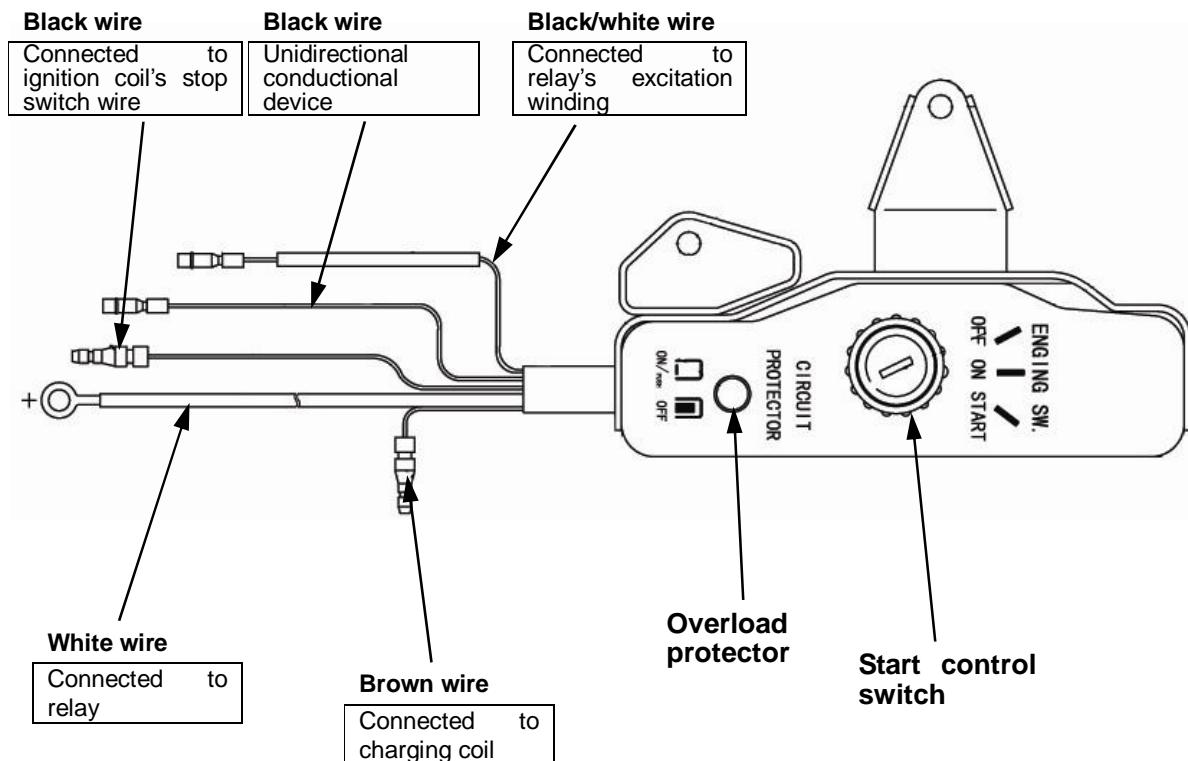


7) Check the operation of the ratchet by pulling the starter rope out several times.



## 2. Disassembly/reassembly of control box (optional)

### 1. Disassembly/reassembly



### 2. Inspection

#### Combination switch

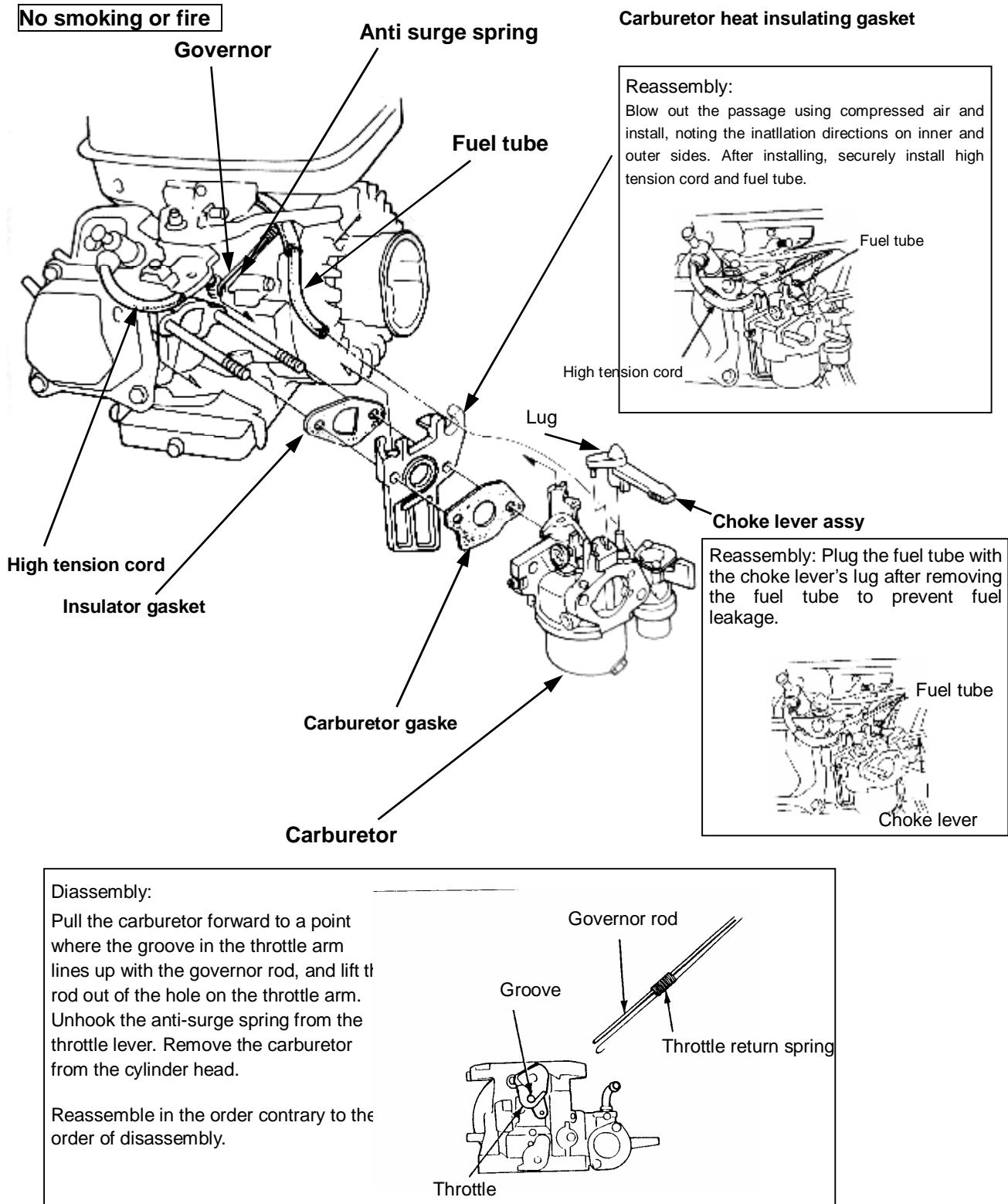
Check for continuity between the wires shown in the following table with the switch in different positions.

Position		OFF			ON			START		
		Color State	W, Bi/W	Br, W	Bi, ground	W, Bi/W	Br, W	Bi, ground	W, Bi/W	Br, W
1	ON			—	—		—	—	—	—
2	OFF									

### 4-3. Carburetor

#### 1. Removal / disassembly

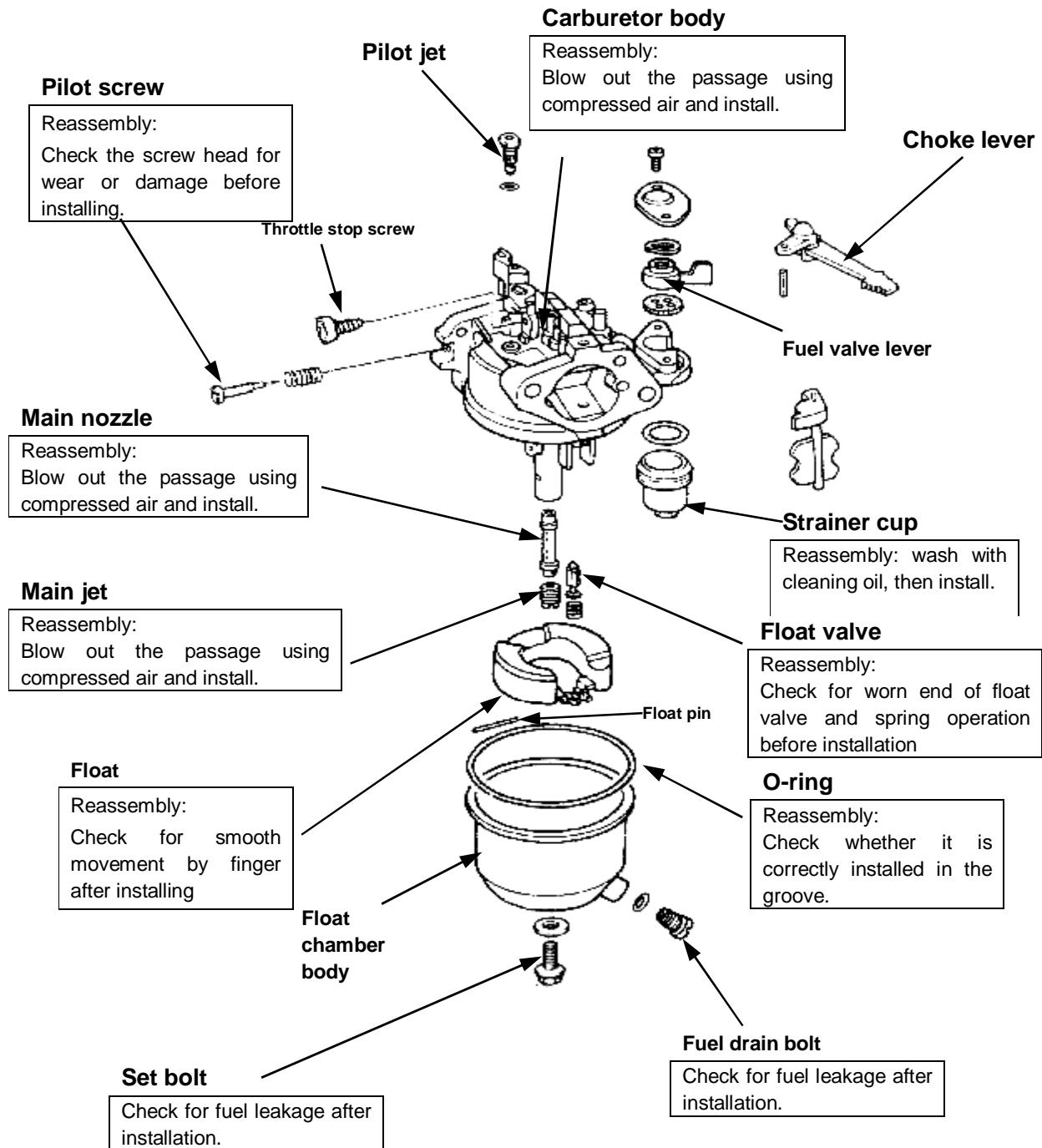
##### NOTICE



## 2. Disassembly/reassembly

**NOTICE**

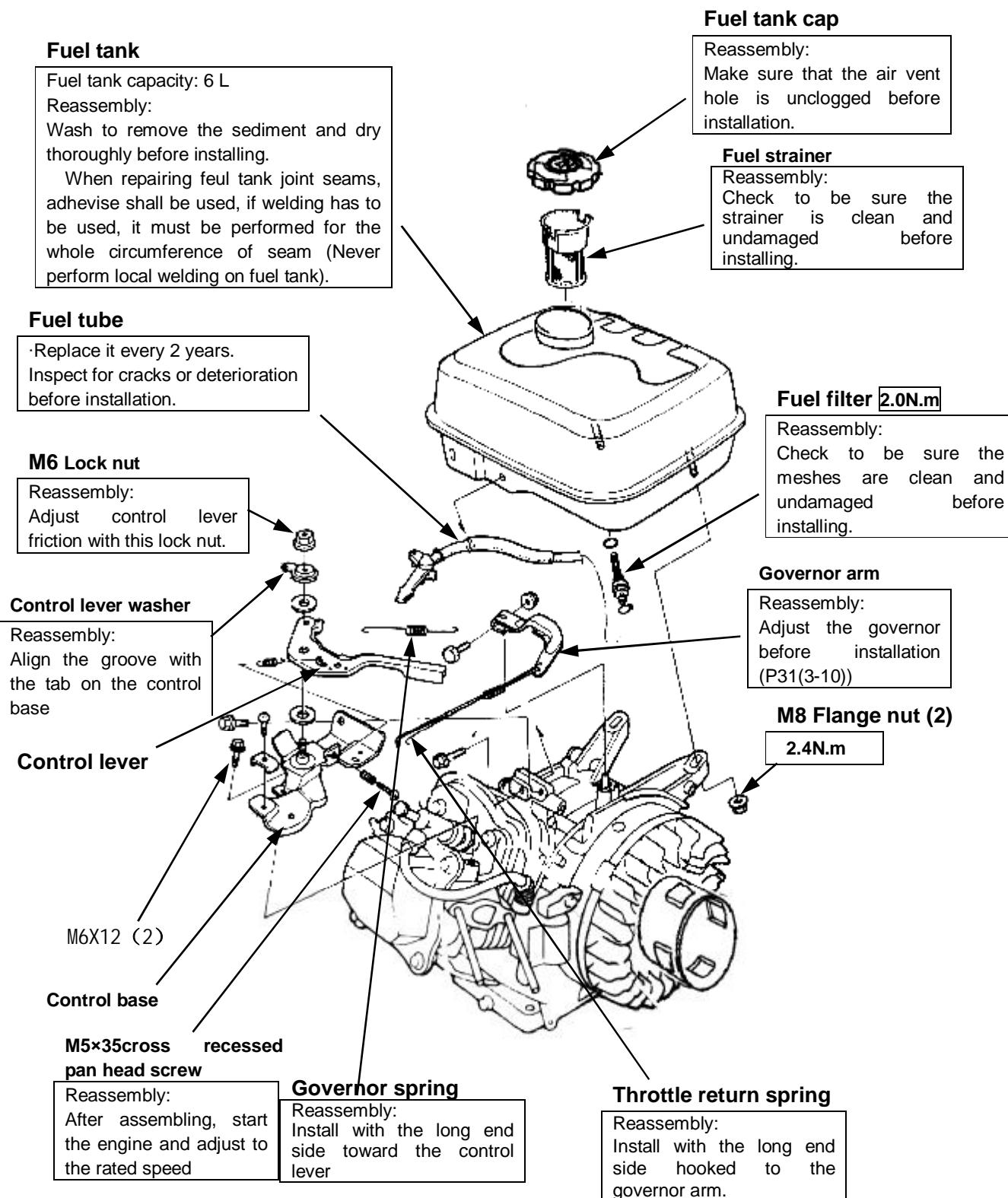
• Before assembly, loosen the drain screw and drain the carburetor completely and keep heat, spark and flame away.



#### 4-4. Fuel tank and speed governing system

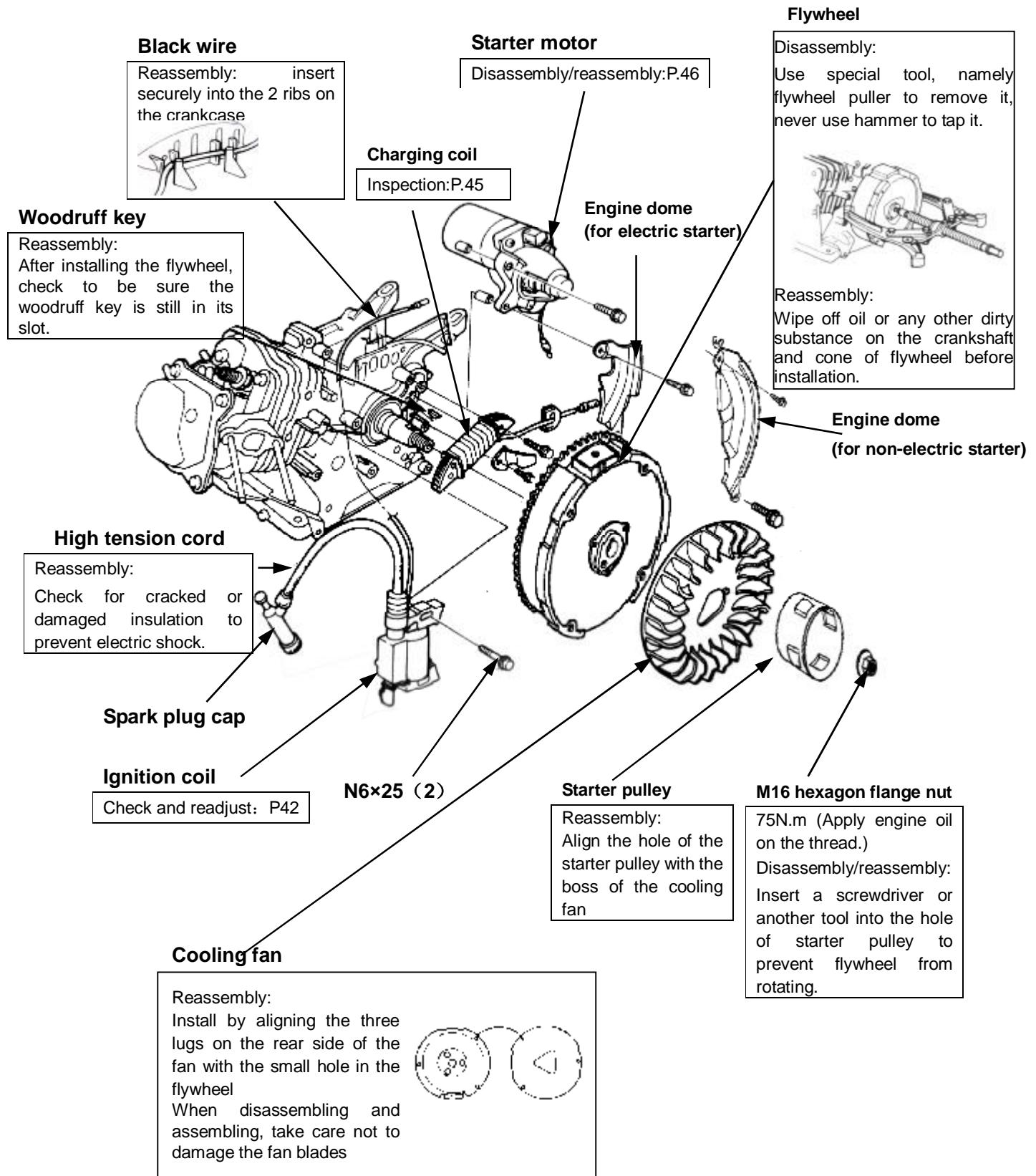
##### Disassembly/reassembly

**NOTICE** Gasoline is highly flammable and explosive, keep smoking, spark and flame away, and drain the fuel tank completely before removal and disassembly.



## 4-5. Flywheel, ignition coil, starter motor and lighting coil

### 1. Disassembly/reassembly

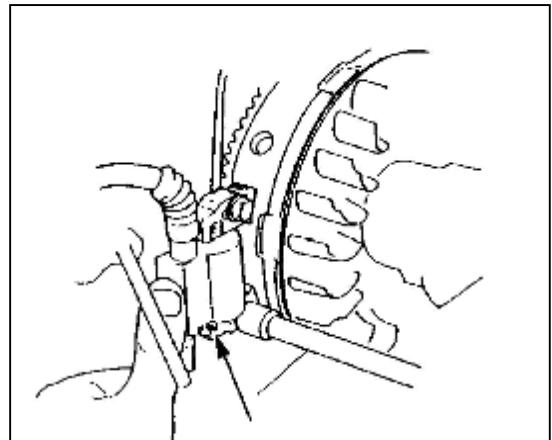


## 2. Adjustment of ignition coil air gap

1) Insert a thickness gauge or a piece of paper of the same thickness between the ignition coil and flywheel.

2) Push the ignition coil firmly toward the flywheel by hand and tighten the bolt.

Specified	0.4±0.2mm
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Avoid the flywheel's magnet when adjusting, and ensure clearances at both ends of ignition coil are equal.

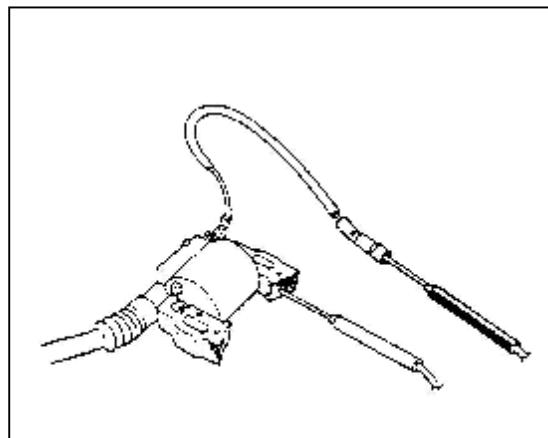
## 3. Inspection of ignition coil, lighting coil and charging coil

### 1) Ignition coil

#### < Primary side >

Measure the resistance of primary coil by attaching one ohm-meter lead to the ignition coil's primary lead while touching the other test lead to the iron core.

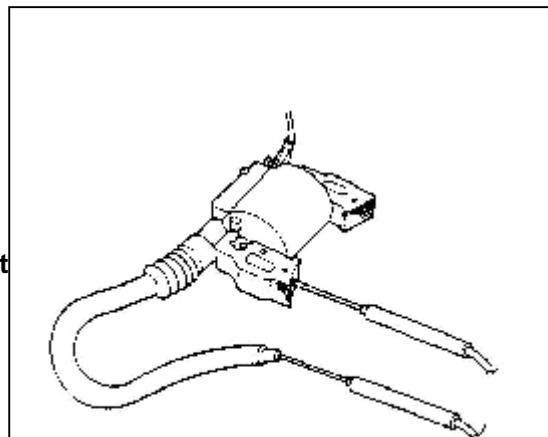
Primary side resistance	0.8~1.0Ω
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#### < Secondary side >

Measure the resistance of the secondary side of the coil by removing the spark plug cap and touching one test lead to the high tension cord while touching the other test lead to the iron core.

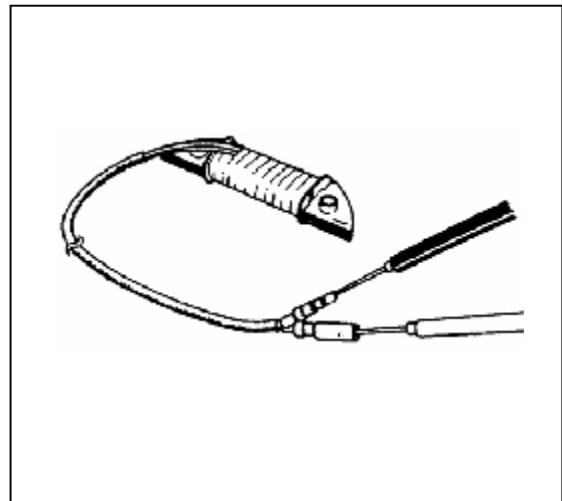
Secondary side resistance	5.9 ~ 7.1KΩ
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## 2) Lighting coil

Measure resistance between the two leads.

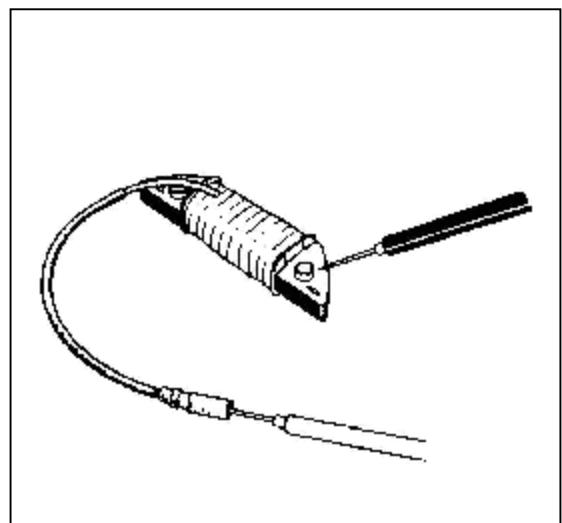
	Resistance value
6V-15W	0.21~0.27Ω
6V-25W	0.09~0.15Ω
12V-15W	1.24~1.44Ω
12V-25W	0.36~0.46Ω
12V-50W	0.18~0.23Ω



## 3) Charging coil

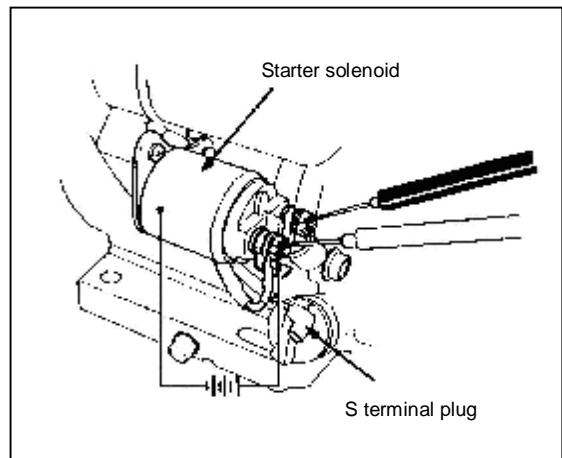
Measure resistance between the two leads.

Resistance value	3.15-3.85Ω
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## 4. Starter relay

Disconnect negative of battery, and disconnect electromagnetic relay's S terminal plug, and connect a 12 V battery between starter terminal and starter body, then check continuity using a tester as shown. There should be continuity when the battery is connected, and no continuity when the battery is not connected.

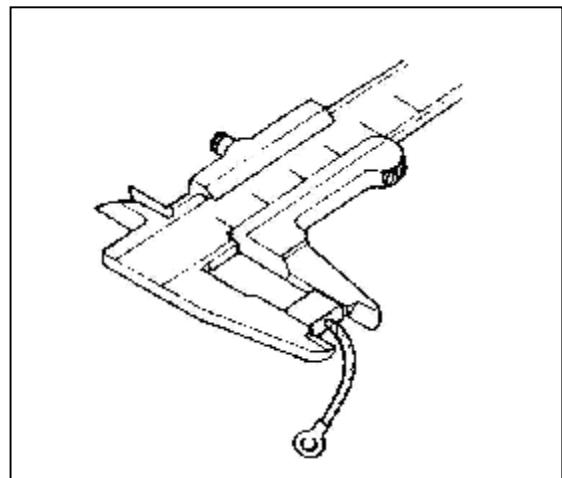


## 5. Starter motor

### 1) Brush length

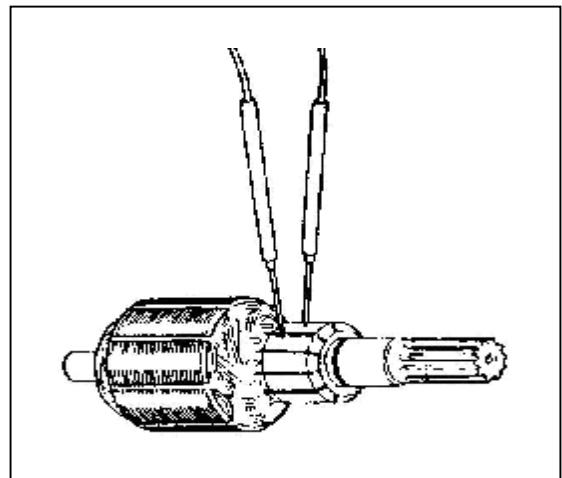
**Check brush length and replace it if it is shorter than service limit due to wear.**

Standard	Service limit
11.0 mm	6.0 mm



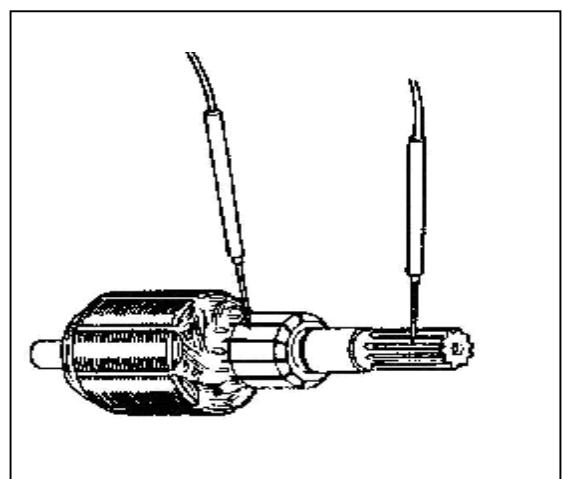
### 2) Continuity between commutator segments

**Check for continuity between segments, if an open circuit (on continuity) exists between any two segments, replace the armature.**



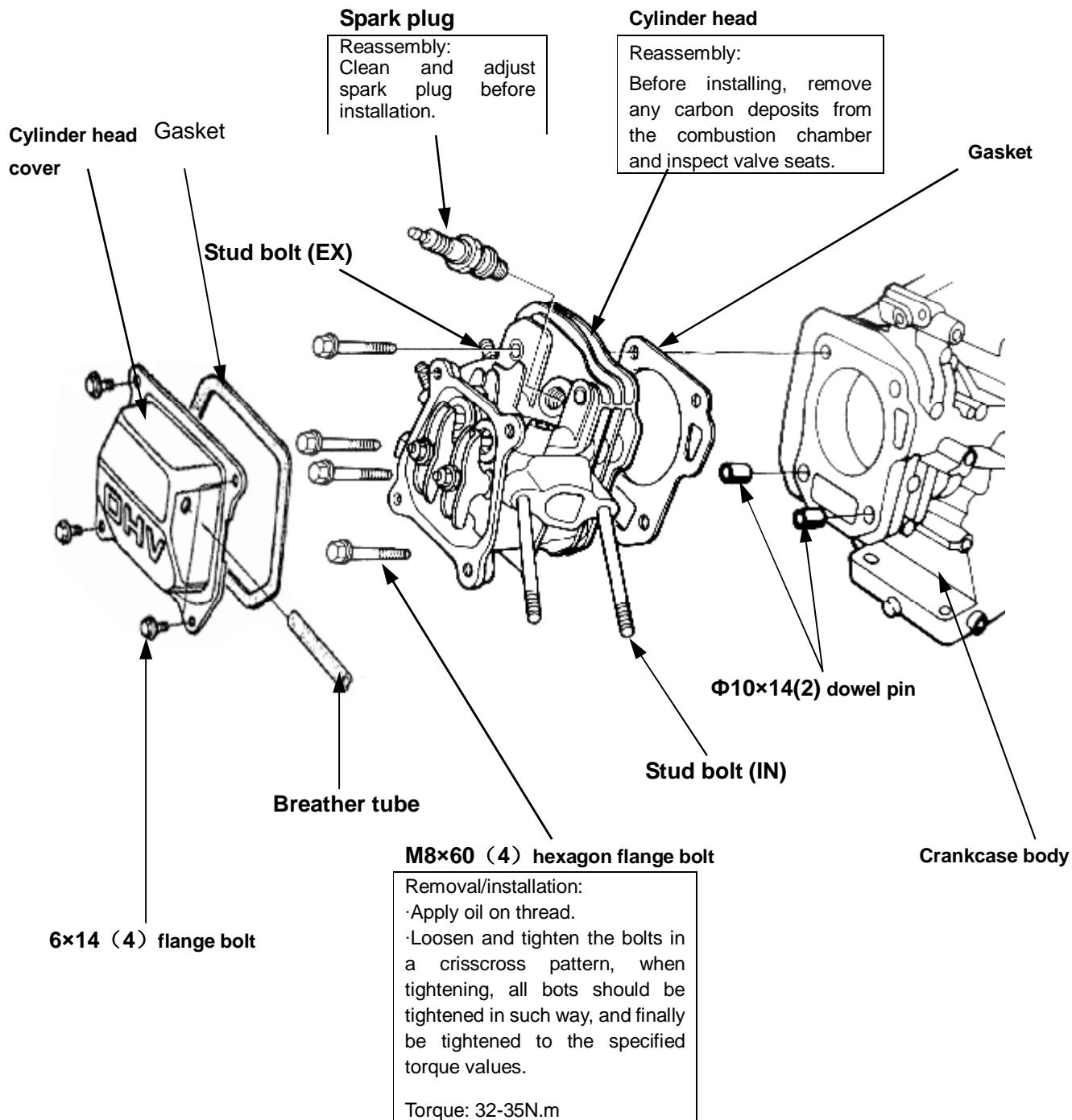
### 3) Continuity check - commutator-to-shaft

**Check for continuity between the commutator and armature shaft, Replace the armature if continuity exists between any of the commutator segments and the armature shaft**

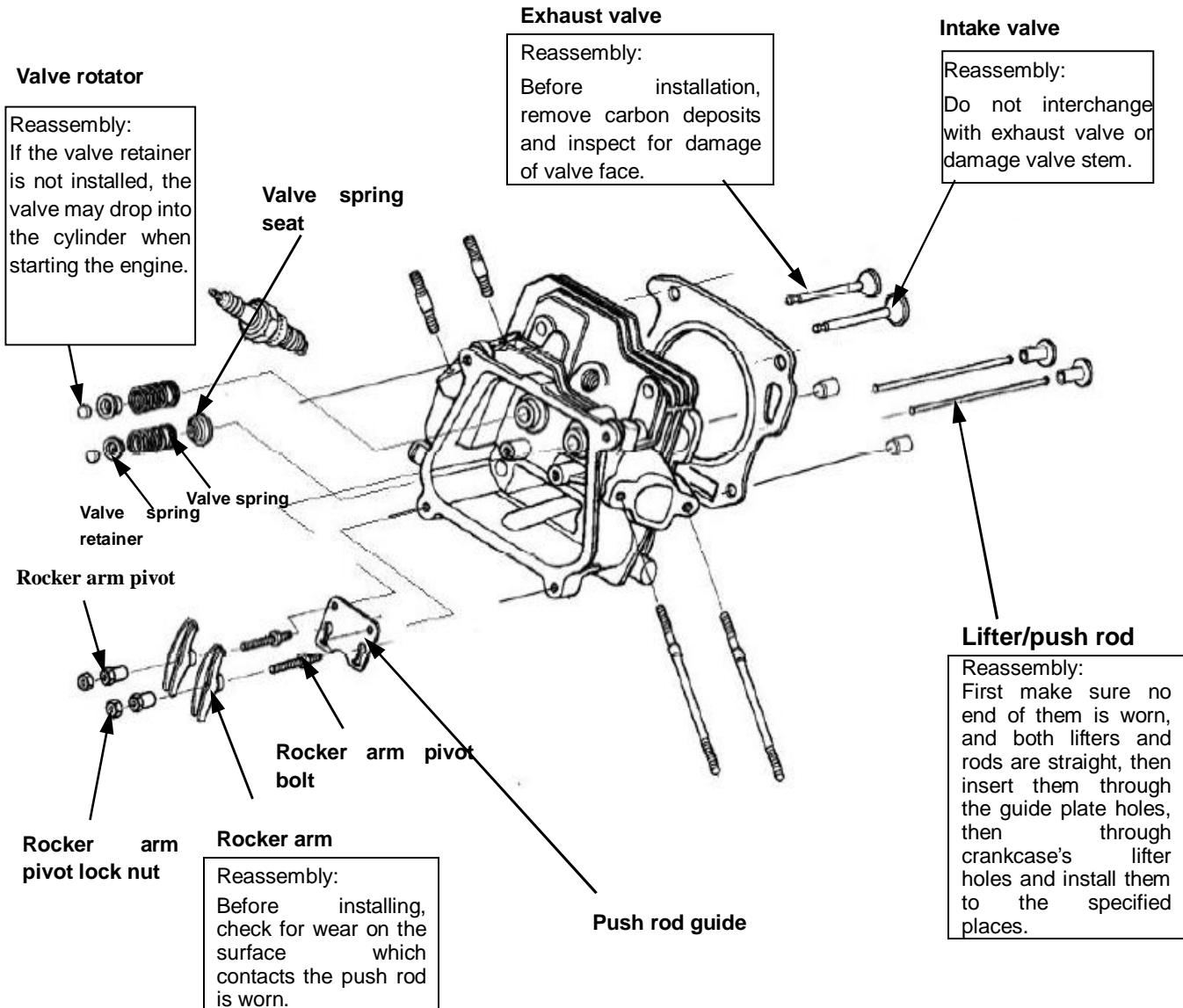


## 4-6. Cylinder head and valves

### 1. Removal/installation

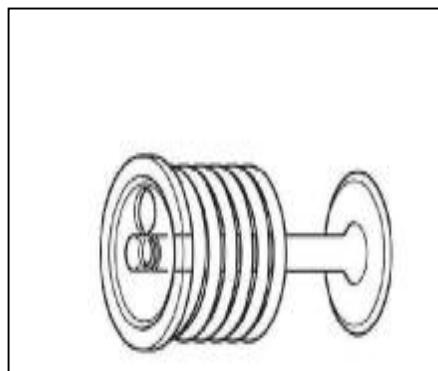


## 2. Disassembly/reassembly

**Valve spring retainer:**

**Laterally move valve stem's front end along the valve spring's retainer's center hole and remove the valve spring retainer.**

**Do not remove the valve spring retainer while the cylinder head is installed, or the valves will drop into the cylinder.**

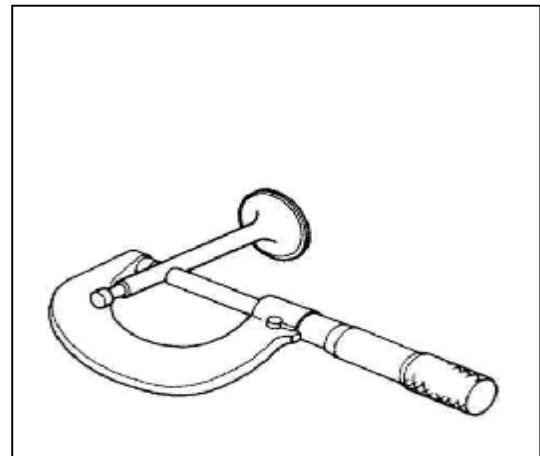


### 3. Inspection/maintenance/reconditioning:

#### 1) Valve stem O.D

Measure valve stem O.D With a millimeter if it's smaller than the standard value or the service limit, or valve face has visible ablation or cracks, replace the valve.

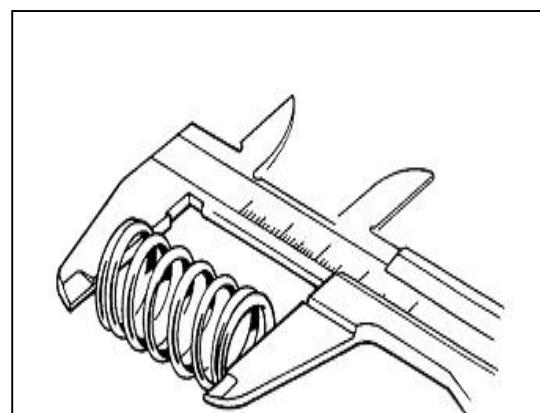
	Standard	Service limit
IN	5.48 mm	5.318 mm
EX	5.44 mm	5.275 mm



#### 2) Valve spring free length

Measure the free length of valve spring. Replace the springs if they are short than standard length or beyond service limit.

Standard	Service limit
30.5mm	29.5mm

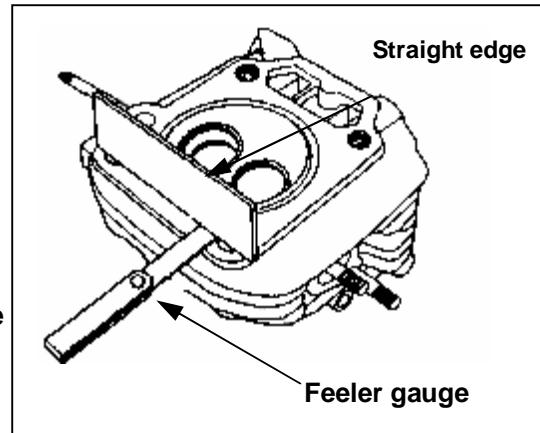


#### 3) Cylinder head

Remove carbon deposits from the combustion chamber, clean off any gasket material from the cylinder head surface.

Check the spark plug hole, valve areas and valve guides for cracks.

Check the cylinder head for warpage with a straight edge and a feeler gauge



Service limit	Replace if above 0.10 mm
---------------	--------------------------

#### 4) Valve guide

Inspection:

a) Check whether valve guide inner surface is smooth and flat, whether there is any scratch or drag mark on it; whether valve guide fits firmly with cylinder head.

b) Ream the valve guides to remove any carbon deposits before measuring.

Replace the guides if they are short than standard or beyond service limit.

Standard	Service limit
5.50mm	5.572mm

Replace:

a) Chill the replacement valve guide in the freezer section of a refrigerator for about an hour.

b) Drive the valve guide out of the head from the combustion chamber side using a valve guide driver.

**NOTICE**

When driving the valve guide out, be careful not to damage the head.

c) Install the new valve guide from the valve spring side of the cylinder head.

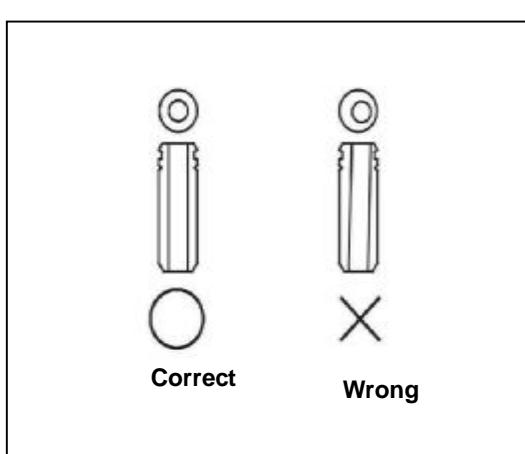
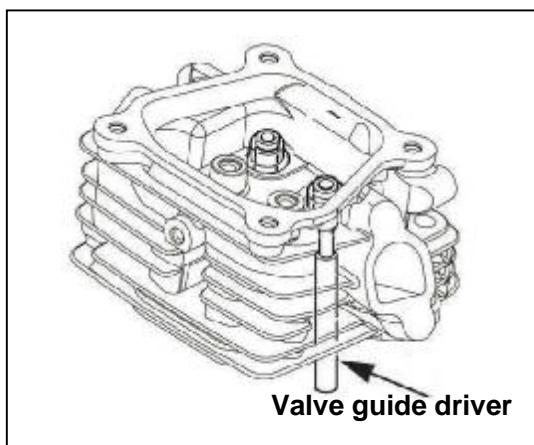
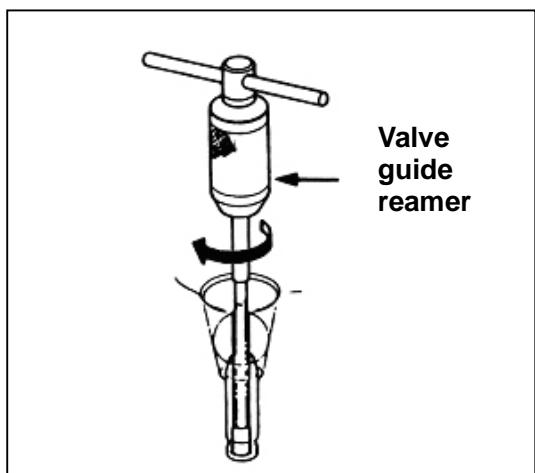
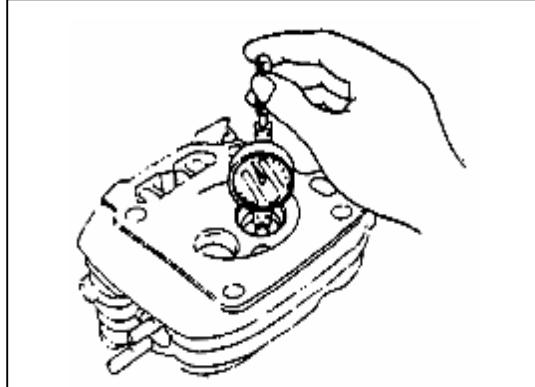
Exhaust valve: drive the valve guide until the clip is fully seated as shown.

Intake valve: drive the intake valve guide until it reaches the specified height (measured from top of valve guide to cylinder head surface).

d) After installation, inspect the valve guide for damage. Replace the guide if damaged.

Valve seat reconditioning:

For best results, be sure the cylinder head is at room temperature before reaming the valve guide.

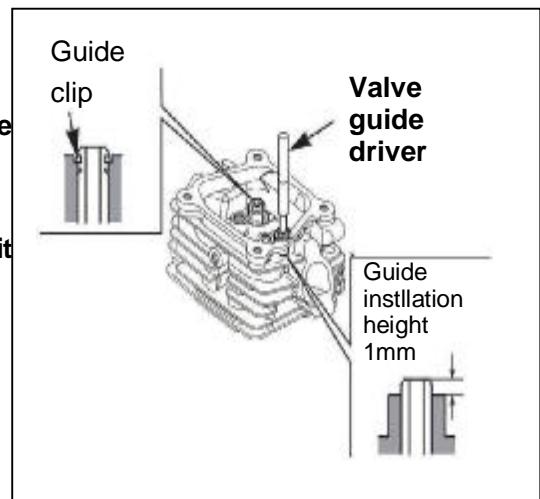


a) Coat the reamer and valve guide with cutting oil. Rotate the reamer clockwise through the valve guide the full length of the reamer.

Continue to rotate the reamer clockwise while removing it from the valve guide.

Tool: valve guide reamer

b) Thoroughly clean the cylinder head to remove any cutting residue.



c) Check the valve guide bore; it should be straight, round and centered in the valve guide. Insert the valve and check operation. If the valve does not operate smoothly, the guide may have been bent during installation. Replace the valve guide if it is bent or damaged.

d) Check the valve stem-to-guide clearance.

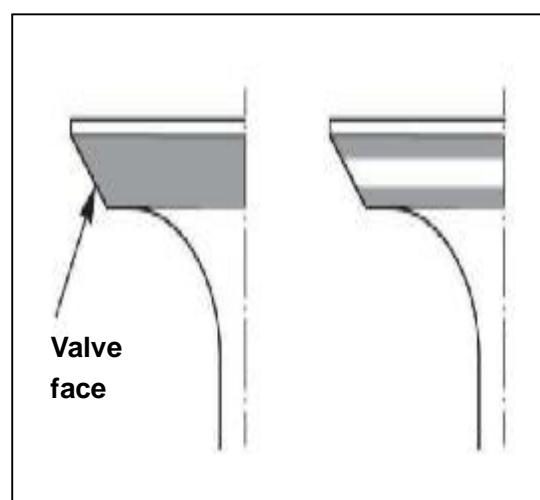
e) Stem -to- guide clearance: Subtract each valve stem OD from the corresponding guide ID to obtain the stem -to- guide clearance.

f) If the stem-to-guide clearance exceeds the service limit, determine if the new guide with standard dimensions would bring the clearance within tolerance. If so, replace the guide as necessary and ream to fit. Recondition the valve seat whenever the valve guide is replaced.

## 5) Valve seat:

a) Thoroughly clean the combustion chambers and valve seats to remove carbon deposits. Apply a light coat of red lead power or erasable color on the valve faces.

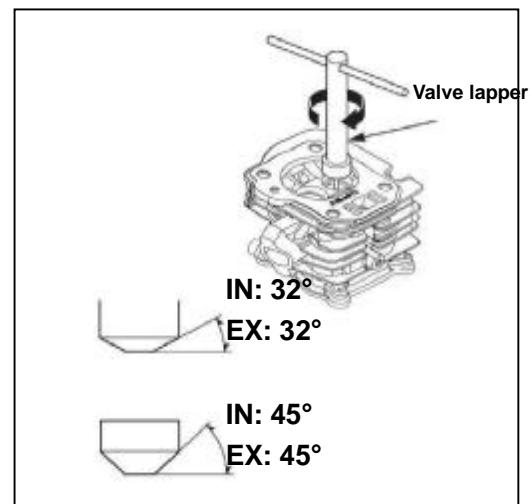
b) Insert the valve, and then lift them and snap them close against their seats several times. Be sure the valve does not rotate on the seat. The transferred marking compound will show any area of the seat that is not concentric.



c) Use a 45°cutter, remove enough material to produce a smooth and concentric seat. Turn the cutter clockwise, never counterclockwise.

Tool: valve lapper

d) Use the 32°-45° and 60° cutter to narrow and adjust the valve seat so that it contacts the middle of the valve face.

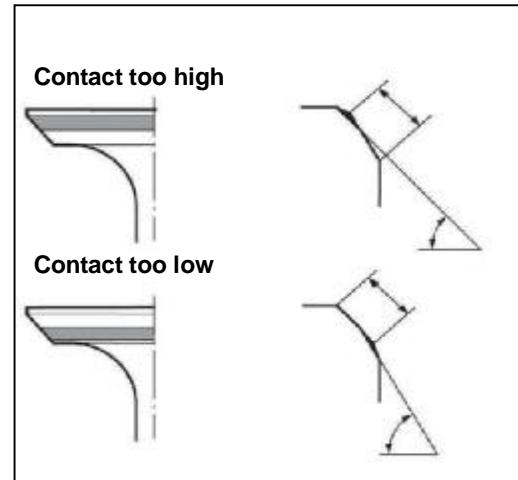


The 32° cutter removes material from the top edge (contact too high).

The 45° cutter removes material from the bottom edge (contact too low).

Be sure that the width of the finished valve seat is within specification.

Standard	Service limit
0.8mm	2.0mm

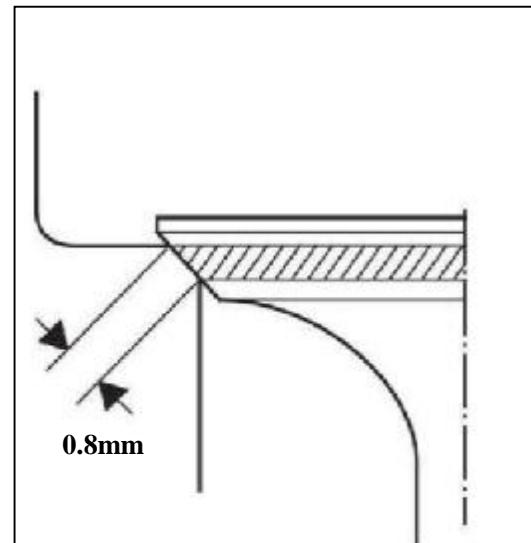


e) Make a light pass with the 45° cutter to remove any possible burrs at the edges of the seat.

f) After resurfacing the seats, inspect for even valve seating.

Apply a light coat of Prussian Blue or erasable marker ink on the valve faces. Insert the valves, and then lift them and snap them close against their seats several times. Be sure the valve does not rotate on the seat.

The seating surfacing, as shown by the transferred marking compound, should have good contact all the way around.



g) Apply lapping compound on the valve face, and use a hand valve lapper to recondition the valve seat.

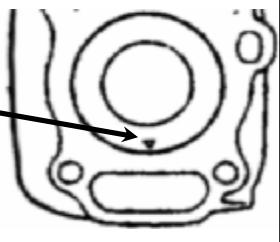
h) After reassembly, check and adjust the valve clearance.

## 4-7. Crankcase body, piston, connecting rod and crankshaft

### 1. Disassembly/reassembly

#### Piston

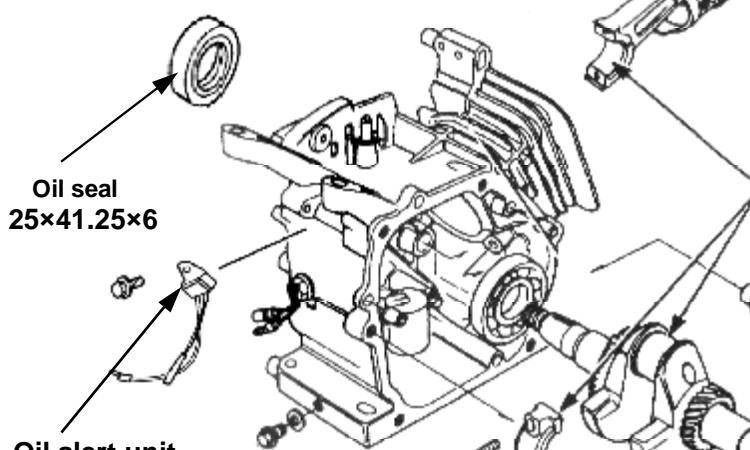
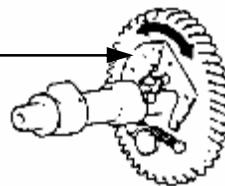
Reassembly:  
Install with the triangle mark toward the push rod hole.



#### Camshaft assy

Reassembly:  
Check that the decompressor weight moves smoothly and the spring is not weak or worn, then align the triangle marks and install.

Decompressor weight



#### Oil alert unit

Inspection: With the engine running, when connecting the yellow lead and ground wire for a moment the engine should stop. If not, replace oil alert unit.

#### Connecting rod cap

Reassembly:  
Install with the oil dipper toward the camshaft and the ribs on the cap and connecting rod aligned.

#### Crankshaft

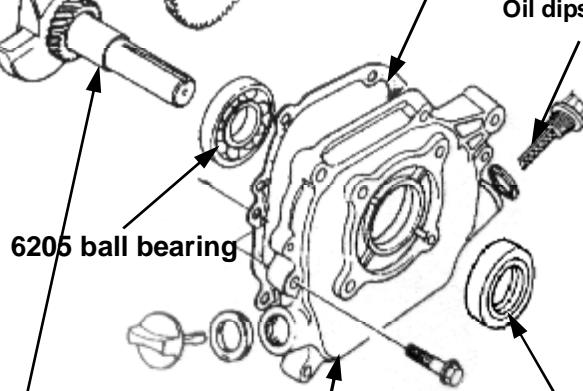
Reassembly:  
Push in until the bearing touches the crankcase. Be careful not to damage the oil seal.

#### Valve lifter

Reassembly:  
Install the lifters immediately before installing the camshaft; take care not to let lifters drop.

Crankcase cover seal gasket

Oil dipstick



#### Oil seal 25×41.25×6

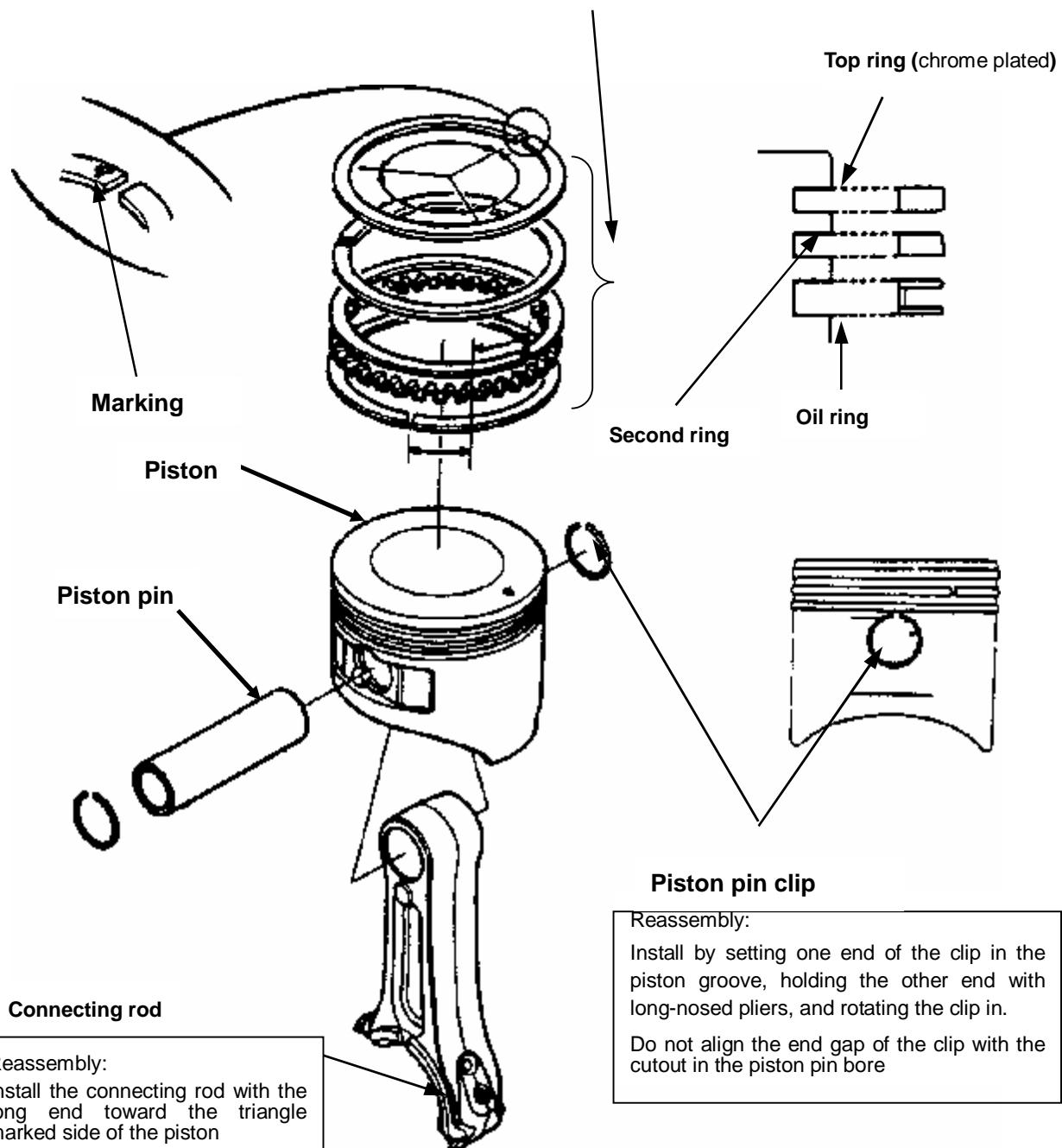
Reassembly:  
Take care not to damage the lip of the oil seal when inserting the crankshaft

Crankcase cover

## 2. Piston/piston rings

### Reassembly:

- 1) Install all rings with the markings facing upward
- 2) Be sure that the top and second rings are not interchanged.
- 3) Check that the rings rotate smoothly after installation.
- 4) Space the piston ring end gaps 120 degrees apart and do not align the gaps with the piston pin bore



### Reassembly:

Install by setting one end of the clip in the piston groove, holding the other end with long-nosed pliers, and rotating the clip in.

Do not align the end gap of the clip with the cutout in the piston pin bore

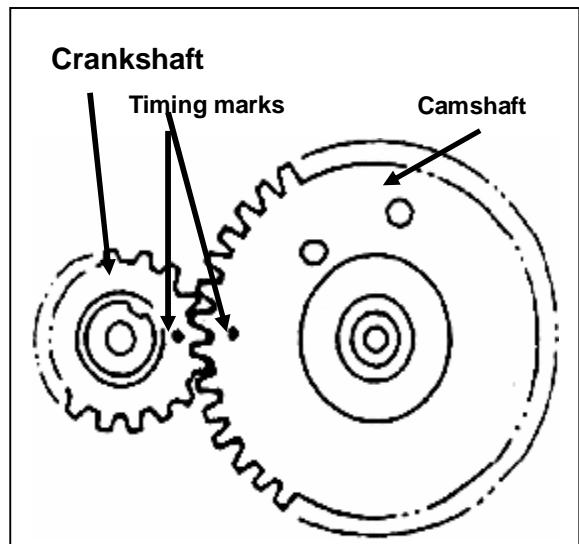
### Timing mark alignment

Align the punch marks on the camshaft gear and timing gear (smaller gear on the crankshaft) when installing camshaft.

### 3. Inspection

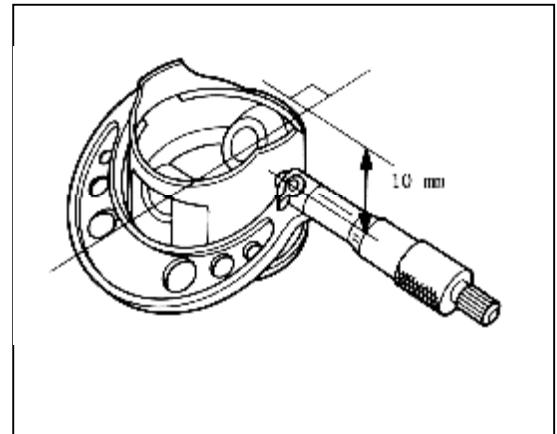
#### Piston inspection

Check the contact between piston and cylinder, defects of ring grooves, ablation and cracks on piston top, etc. replace the piston if the damage is severe.



#### Removal of carbon deposits

Carbon deposits accumulate on piston top and upper edge of cylinder. Remove carbon deposits completely before inspection. Saturate the carbon deposits with kerosene and then use a blunt scraper or a wire brush to remove carbon deposits.



#### 1) Piston skirt O.D.

measure and record the piston O.D. using an outside micrometer at a point 10mm (0.4in) from the bottom of the skirt 90° to the piston pin bore. Replace it if its size exceeds service limit.

	Standard	Service limit
G120	59.985mm	59.845 mm
G160 200	67.985mm	67.845 mm

#### 2) Piston-to-cylinder clearance

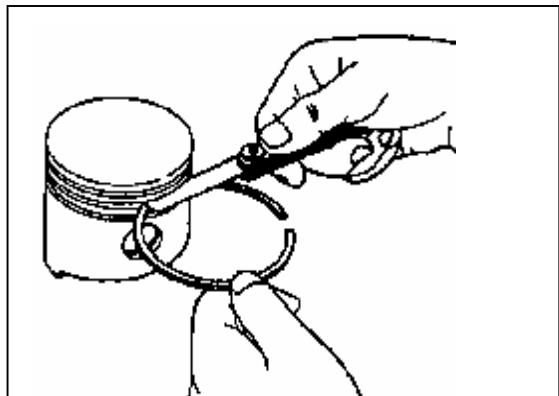
The difference between the cylinder bore's maximum diameter and piston skirt's outer diameter is the piston-to-cylinder clearance.

Standard	Service limit
0.015-0.050mm	0.12mm

### 3) Piston ring side clearance

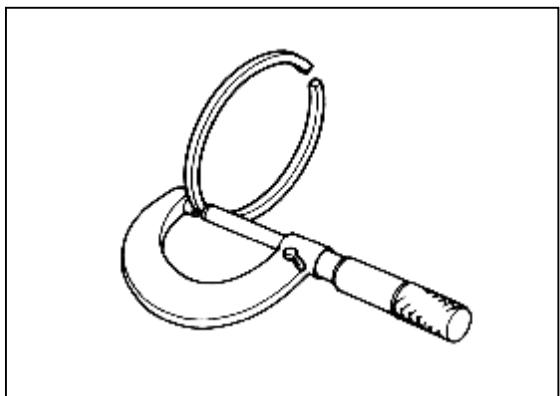
When inspecting put rings in the corresponding piston grooves and they should be able to rotate freely without looseness or stickiness. Then put a feeler gauge between the ring and groove's upper or lower surface to measure.

Standard	Service limit
0.015-0.045mm	0.15mm



### 4) Piston ring width

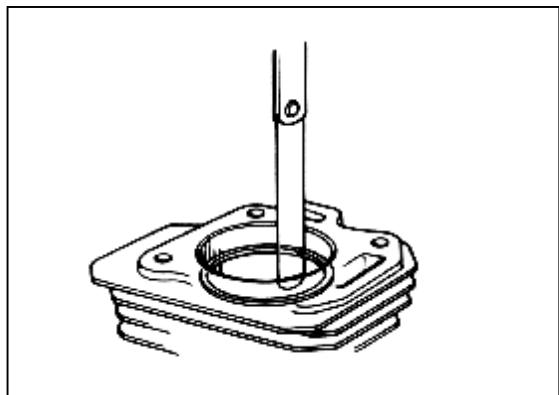
	Standard	Service limit
Top /second	1.5mm	1.37 mm



### 5) Piston ring end gap

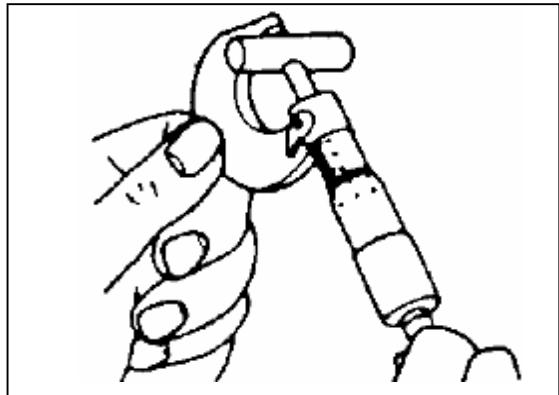
	Standard	Service limit
Top /second	0.02-0.04mm	1.0mm

Before measuring piston ring end gap, correctly install the rings onto the piston. Then put the piston into the cylinder. As oil ring is used together with top ring and second rings, so if any these rings should be they should be replaced together.



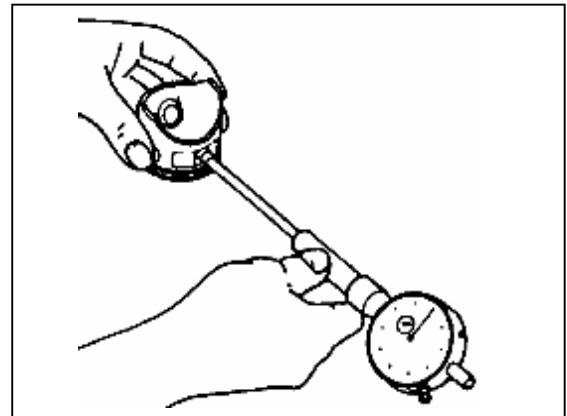
### 6) Piston pin O.D.

	Standard	Service limit
G120	13.0mm	12.954 mm
G160 200	18.0mm	17.954 mm



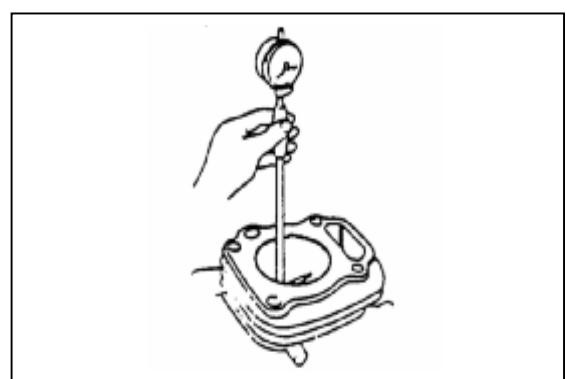
**7) Piston pin bore I.D.**

	Standard	Service limit
G120	13.002mm	13.048 mm
G160 200	18.002mm	18.048 mm

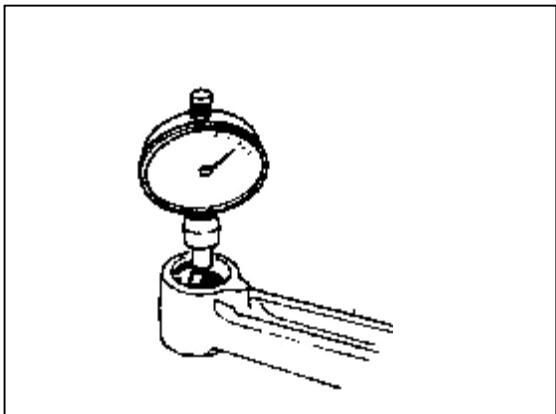
**8) Piston pin-to-piston pin bore clearance**

**Measure piston pin bore I.D. with an inside micrometer and piston pin O.D. with an outside micrometer. Then calculate the clearance using the measured values. If the clearance is out of service limit, the piston or piston pin may be replaced according to the wearing condition.**

	Standard	Service limit
G120	0.002-0.014mm	0.08 mm
G160 200	0.002-0.014mm	0.06 mm

**9) Cylinder I.D.**

	Standard	Service limit
G120	60.0mm	60.165 mm
G160 200	68.0mm	68.165 mm

**Inspection of connecting rod**

**Replace the connecting rod if it's bent, warped, or its big end cap or the outer race of its small end's shaft sleeve is loose, or any of its end has cracks.**

**1) Connecting rod small end I.D.**

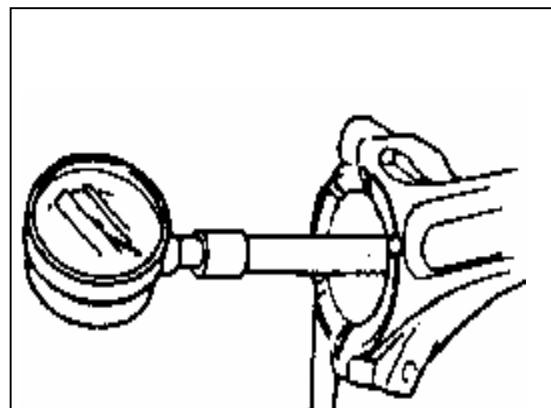
**Replace the connecting rod if its small end I.D. is smaller than standard value or is out of service limit.**

	Standard	Service limit
G120	13.005mm	13.07 mm
G160 200	18.002mm	18.07 mm

## 2) Big end I.D.

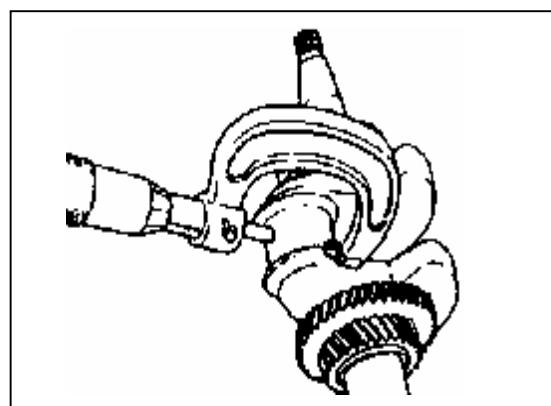
Replace the connecting if its big end I.D. is smaller than standard value or is out of service limit.

	Standard	Service limit
G120	26.02mm	26.066 mm
G160 200	30.02mm	30.066 mm



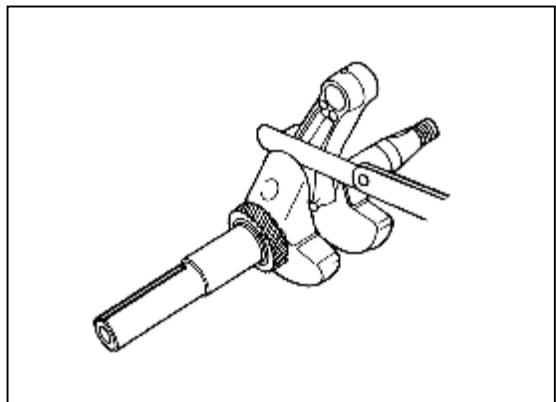
## 3) Crankpin O.D.

	Standard	Service limit
G120	25.98mm	25.92 mm
G160 200	29.98mm	29.92 mm



## 4) Connecting rod big end side clearance

Standard	Service limit
0. 1-0.7mm	1.1mm



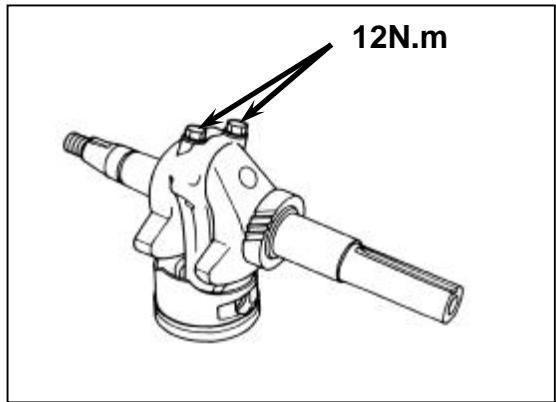
## 5) Connecting rod big end oil clearance (radial)

- Clean all oil from the crankpin.
- Place a piece of plastic gauge on the crankpin, install the connecting rod and cap, and tighten the bolts to the specified torque.

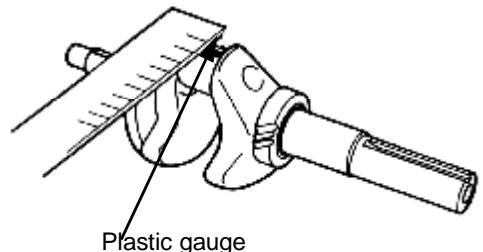
Torque: 12-14N.m

Note: Do not rotate the crankshaft while tightening the bolts.

- Remove the connecting rod and measure the plastic gauge.



d) If the clearance exceeds the service limit, replace the connecting rod and recheck the clearance. If the clearance after installing the new connecting rod still exceeds the service limit, lap the neck journal and use a connecting rod lower than the standard value.

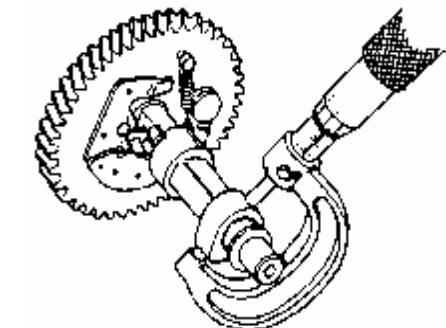


#### Inspection of camshaft

As the main driving part of the gasoline engine's valve actuating mechanism, the camshaft controls the intake and exhaust valves' opening and closing following a certain principle. Visually check the cam surface and cam height for any damage, and check whether bearings and camshaft are loose or worn, if so, replace them all.

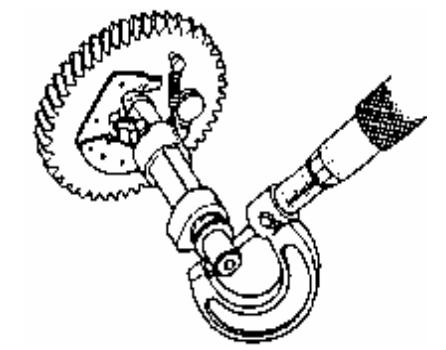
##### 1) Cam height

	Standard	Service limit
IN	27.7mm	27.45 mm
EX	27.75mm	27.50 mm



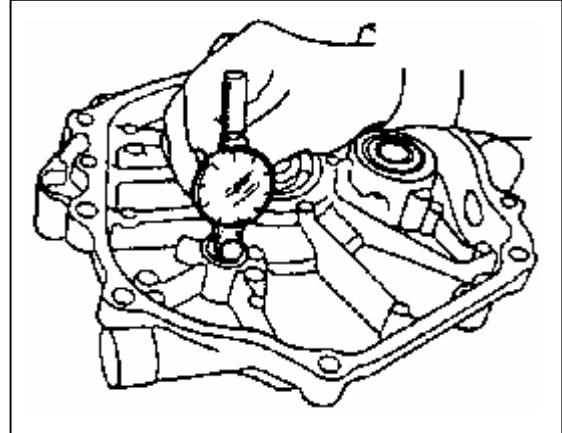
##### 2) Camshaft O.D.

Standard	Service limit
13.984mm	13.916mm



**3) Camshaft holder ID**

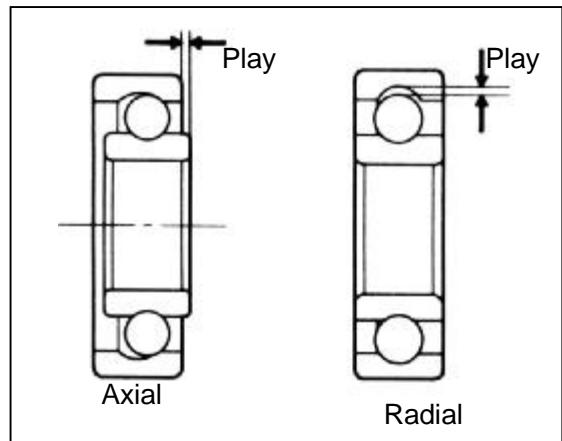
Standard	Service limit
14.0mm	14.048mm

**Inspection of bearings**

**Clean the bearing in solvent and dry it.**

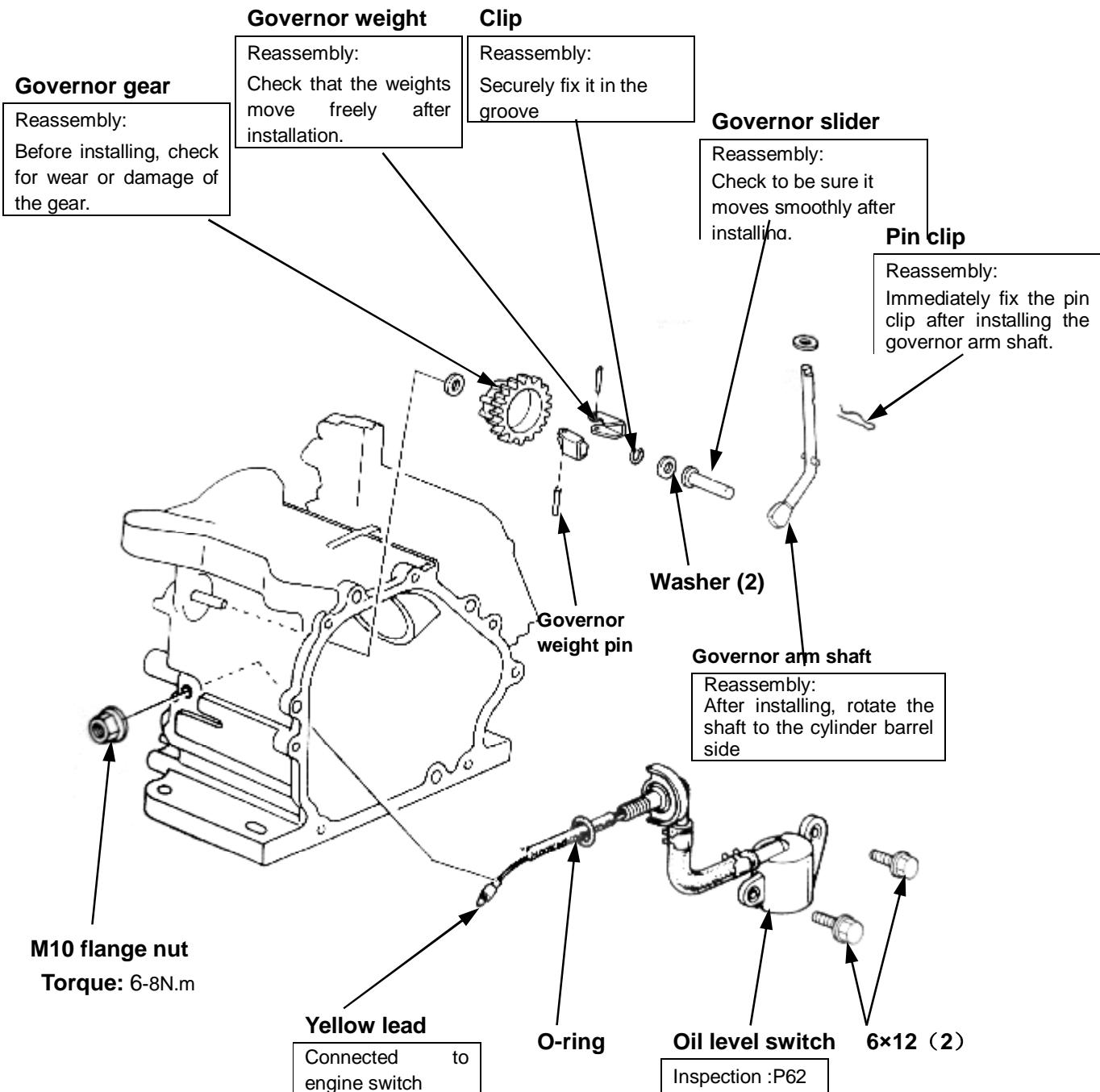
**Spin the bearing by hand and check for play.**

**Replace the bearing if it is noisy or has excessive play.**



## 4-8. Governing gear and fuel level switch

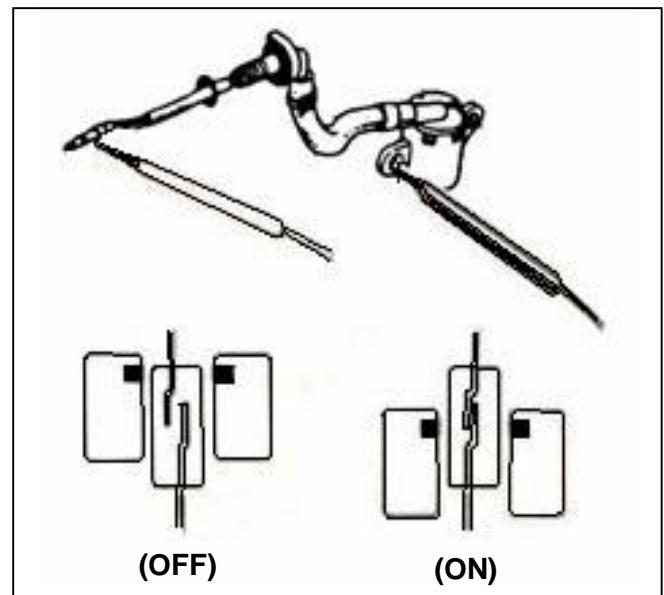
### 1. Disassembly/reassembly



## 2. Inspection

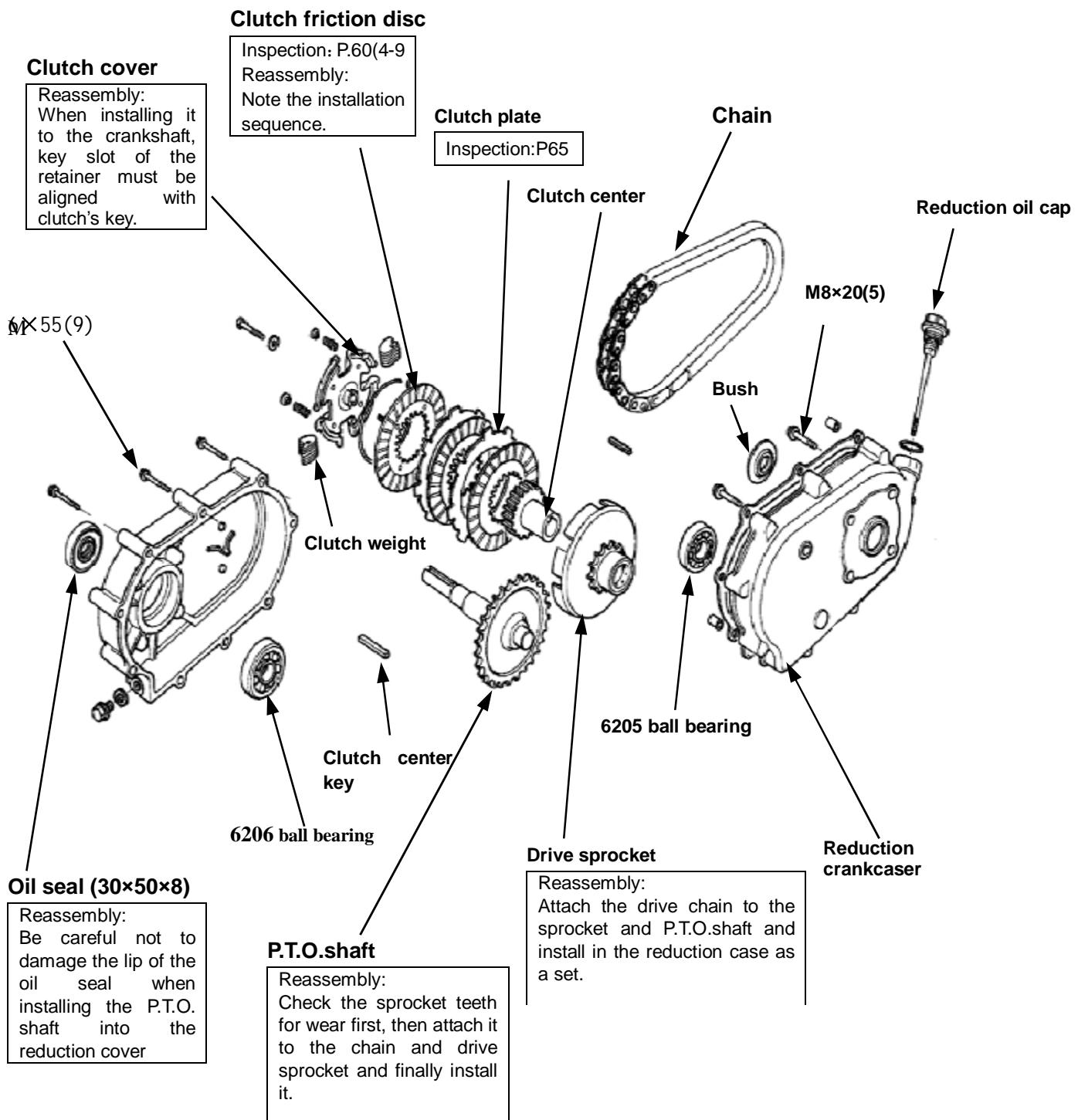
### Oil level switch

- 1) Hold the oil level switch upside down to confirm there no continuity between yellow lead and ground wire.
- 2) Hold the oil level switch in its normal position, confirm the continuity exists between the yellow lead and ground wire.
- 3) Inspect the float by dipping the oil level switch into a container of oil, confirm there is no continuity between the yellow lead and ground wire.

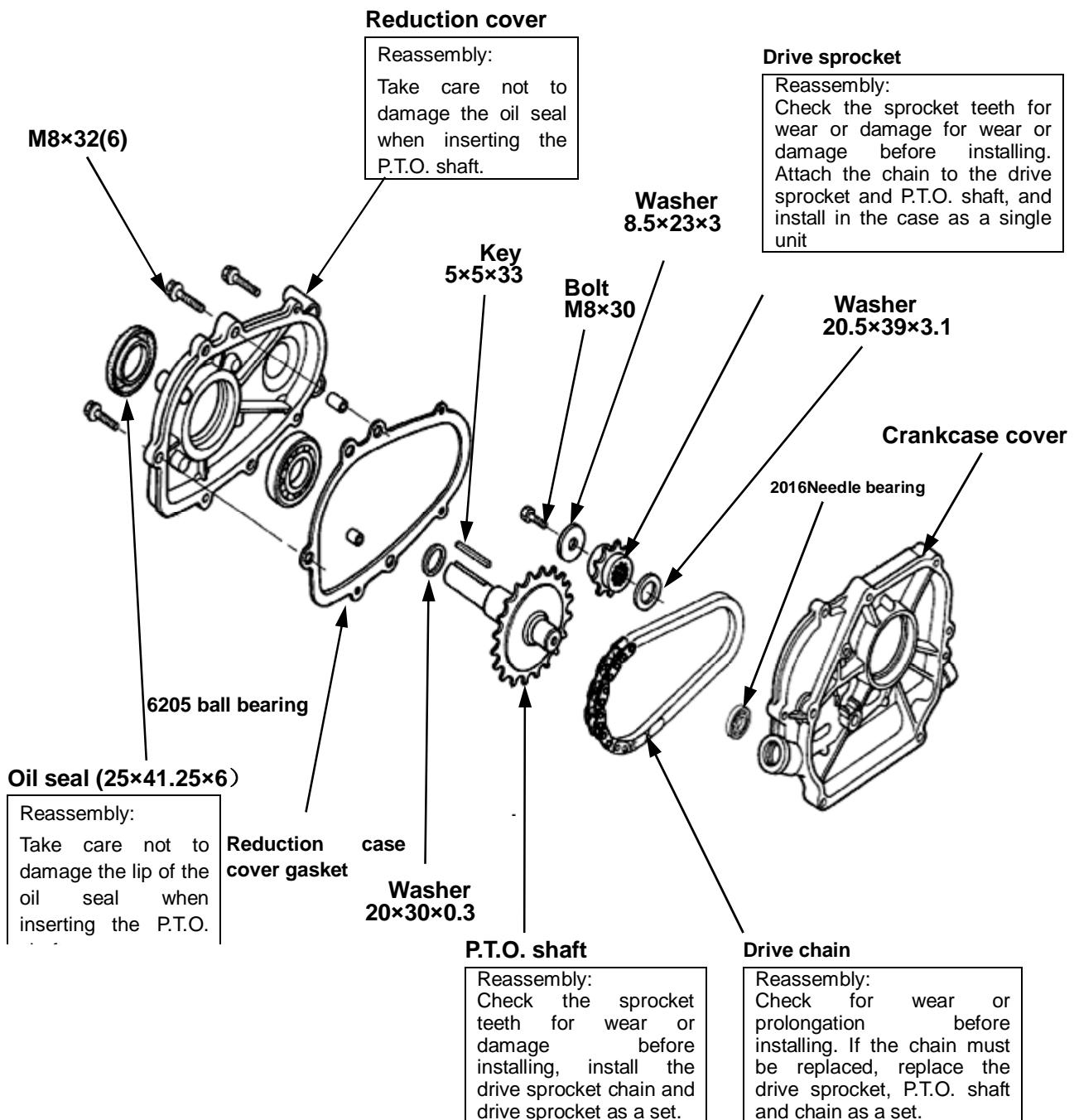


## 4-9. Reduction system

### 1. 1/2 reduction (with centrifugal clutch)



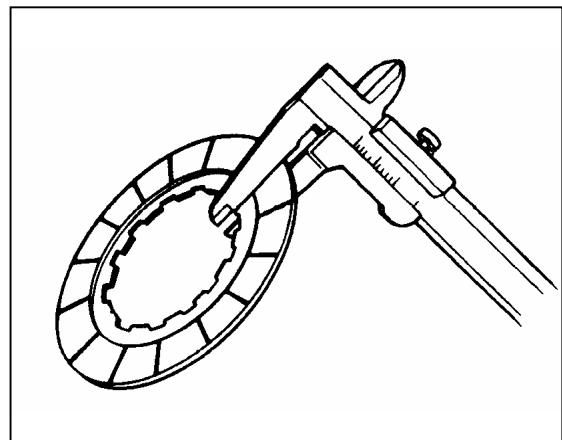
## 2. 1/2 chain type



### 3. Inspection

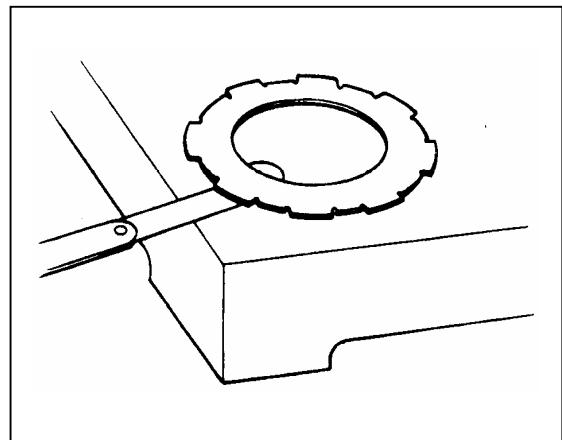
#### 1) Clutch friction disc

Standard	Service limit
3.5mm	3.0mm



#### 2) Clutch plate

**Check the clutch plate warpage on a flat plate using a feeler gauge.**



#### 4-10. Battery (optional)

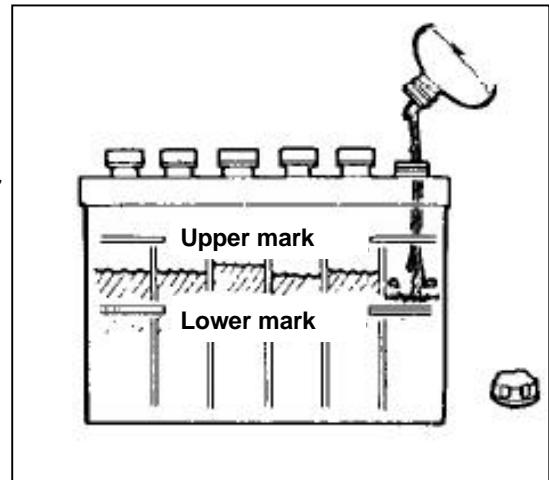
Use a battery rated at 12V, 18AH or more.

##### NOTICE

Do not reverse polarity. Serious damage to the generator and/or battery may occur.

Check the electrolyte level to be sure that it is between the marks on the case.

If the level is below the lower mark, remove the caps and add distilled water to bring the electrolyte level to the upper mark. The cells should be equally full.



##### WARNING

- A battery can explode if you do not follow the correct procedure, seriously injuring anyone nearby. Always keep spark, flame and flammable materials away.
- Battery gases are explosive, don't smoke near it and keep spark and flame away. When charging the battery, keep good ventilation.

Connecting to the starter motor:

Take care not to reverse the polarity or shortcircuiting will occur.

Normally connect the starter cable to the battery positive (+) before connecting the battery negative (-).

- 1) Connect one end of the battery's positive cable to the starter solenoid's terminal.
- 2) Connect one end of the battery's negative cable to a bolt on the engine frame.
- 3) Connect the other end of the battery's positive cable to the positive terminal of the battery.
- 4) Connect the other end of the battery's negative cable to the negative terminal of the battery.

